TITAN Engineering, Inc.
Environmental Consulting and Management

March 7, 2013

STD# 108166

Air Permits Initial Review Team (APIRT) Section, MC 161
Texas Commission on Environmental Quality
12100 Park 35 Circle, Building C, Third Floor
Austin, Texas 78753

via FedEx

Subject: Oil and Gas Standard Permit Registration
Burlington Resources Oil & Gas Company LP
Sugarkane CTB – Baker Dehy Unit
Live Oak County, Texas
CN602989436, RN105698112

RECEIVED
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TCEQ
FIELD OPS/REGION 14

Dear Mr. Johnny Bowers:

On behalf of Burlington Resources Oil & Gas Company LP (Burlington), TITAN Engineering, Inc. (TITAN) is submitting this Oil and Gas Standard Permit (SP) Registration to the Texas Commission on Environmental Quality (TCEQ) for operations at Sugarkane CTB – Baker Dehy Unit (the Site) located near Whitsett in Live Oak County, TX. Upon authorization, this standard permit will authorize the following project:

- Two (2) compressor engines and associated starter vents and blowdowns;
- One (1) glycol dehydration unit;
- Nine (9) controlled atmospheric condensate storage tanks and associated loading;
- Ten (10) controlled atmospheric produced water storage tank and associated loading;
- One (1) controlled atmospheric slop storage tank and associated loading;
- One (1) vapor recovery unit (VRU) control device;
- Three (3) flare combustion control devices; and,
- Piping and fugitive components.

TITAN and Burlington Resources believe that the Site and its associated air emissions meet the requirements of the TCEQ Non-Rule Standard Permit for Oil and Gas Handling and Production Facilities and 30 TAC §116.610, §116.611, §116.614, and §116.615. Please note that this site was permitted under a Permit by Rule (Permit number 87632). Please void the PBR registration for this Site upon approval of this Standard Permit submittal and note that with the inclusion of the Core Data form, a name change is requested for this RN. Additionally, this Site was previously permitted under CN601674351, for that reason a Core Data Form is being included in this registration to update the current customer and site information on the Central Registry (CR) to CN602989436. This Standard Permit Registration (Permit number 108166) has been prepared in accordance with TCEQ guidance and includes the following attachments:

- Attachment 1 presents a process description, area map, receptor map, process flow diagram, and plot plan;
- Attachment 2 contains the applicable TCEQ forms and tables;
- Attachment 3 presents emission rate calculations;
- Attachment 4 describes how the Site qualifies for Standard Permit;
- Attachment 5 includes an impacts evaluation; and
- Attachment 6 includes supporting documentation.

TITAN and Burlington would like to collectively thank you in advance for your review and concurrence with this Oil and Gas Standard Permit Registration. If you have any questions regarding the information presented in this letter and attachments, please do not hesitate to contact Mr. James Woodall at 832-486-6508 or james.woodall@conocophillips.com or me at 469-365-1168 or cchermak@titanengineering.com.

Sincerely,
TITAN Engineering, Inc.

Christina Chermak
Project Manager

Attachments

cc: Ms. Rosario Torres, TCEQ Region 14 – Corpus Christi
Mr. James Woodall, Sr. Environmental Specialist, ConocoPhillips Company
TCEQ Revenue Section, MC-214, Bldg. A, Third Floor, Austin, Texas 78753 (Form PI-1S, CORE Data form, and fee only)

OIL AND GAS STANDARD PERMIT REGISTRATION

CN602989436
RN105698112

Burlington Resources Oil & Gas Company LP
Sugarkane CTB – Baker Dehy Unit
Live Oak County, Texas

Project No. 84800507-78.001

February 2013

ATTACHMENT 1
PROCESS/PROJECT DESCRIPTION

OIL AND GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB – BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

ATTACHMENT 1
PROCESS/PROJECT DESCRIPTION

This Standard Permit registration is being submitted to authorize the co-location of two sites; Sugarkane CTB and Baker Dehy Unit. The aggregate site includes two (2) compressor engines and associated blowdown and starter vent events, one (1) glycol dehydration unit, nine (9) controlled atmospheric condensate storage tanks and associated loading, ten (10) controlled atmospheric produced water storage tanks and associated loading, one (1) controlled atmospheric slop storage tank and associated loading, one (1) vapor recovery unit (VRU) control device, three (3) flare combustion control devices, atmospheric chemical and lube oil storage tanks and piping and fugitive components (the Project) at the Sugarkane CTB – Baker Dehy Unit (the Site) located in Live Oak County, Texas. Figure 1-1 is an area map showing the location of the Site and the surrounding area and Figure 1-2 is a map demonstrating the nearest receptor. Figure 1-3 is a process flow diagram for the Site and Figure 1-4 is a plot-plan of the site demonstrating the location of various equipment components.

Normal Operations

The aggregated Site will receive High Pressure (HP) gas, Low Pressure (LP) gas, and liquids (condensate and water) from eight (8) wells upstream. The gas off the HP and LP separators at the well sites will be metered and enter into their respective HP and LP headers and pipelines. LP gas will flow through the LP scrubber and be sent through compression (Facility Identification Numbers [FINs] COMP-01 and COMP-02) before entering the HP line. Fuel gas to the compressor is injected with H_2S scavenger liquid, which will treat the gas H_2S to 10 ppm or less. HP gas flows into the Site and comingles with the compressor discharge. The combined streams will then pass through a slug catcher and then be treated in a glycol contactor tower. The treated gas is then metered and sent to sales.

The tri-ethylene glycol used in the contactor tower is part of a regenerative system located at the Baker Dehy Unit pad. The rich glycol is first routed through a flash tank which collects off gas and is recompressed and recycled throughout the Site. The rich glycol is sent from the flash tank through the regeneration unit where it is heated (FIN REB-1) and the water is removed, then re-sent to the contactor tower as lean glycol. Emissions associated with the dehy regenerator still vent (FIN DEHY-SV) are controlled by the BTEX condenser and sent back to the reboiler for combustion with the fuel gas.

Pressurized liquids at the Baker site will be measured and sent to a condensate (FIN TK-19) and produced water tanks (FIN TK-20). Emissions from both tanks are captured and controlled with a 98% efficiency by a flare combustion control device (FIN FL-3). The tanks are loaded out periodically by truck (FIN TRUCK3 and TRUCK4).

Pressurized liquids at the Sugarkane CTB will be measured and flow through a separator at the Site. Condensate is sent to and stored in condensate storage tanks (FINs TK-01 through TK-08). The water is routed to the produced water tank (FINs TK-10 through TK-18). The free liquids from the compressor scrubbers, fuel gas scrubbers, and slug catcher will go to the slop tank (FIN TK-09). Emissions from the condensate tanks (FINs TK-01 through TK-08), slop tank (FIN TK-09), and the produced water tank (FINs TK-10 through TK-18) will be routed to a VRU to be captured and controlled at a 100% efficiency. A second flare (FIN FL-2) serves as a back-up during VRU downtime. As demonstrated in the calculations, assist gas is sent to all flares to ensure that the waste gas stream can sustain combustion. Flash off gas from the water knockout separator is recirculated to the compressor, and some condensate continues to the condensate pipeline for sales.

All Sugarkane CTB tanks are loaded out periodically by truck (FINs TRUCK1 and TRUCK2), emissions from which are also controlled by the VRU and the flare during downtime. The Site will also emit emissions due to equipment component leaks (FIN FUG) and small storage tanks for engine operation (FINs TK-AF, TK-LO, and TK-SCAV).

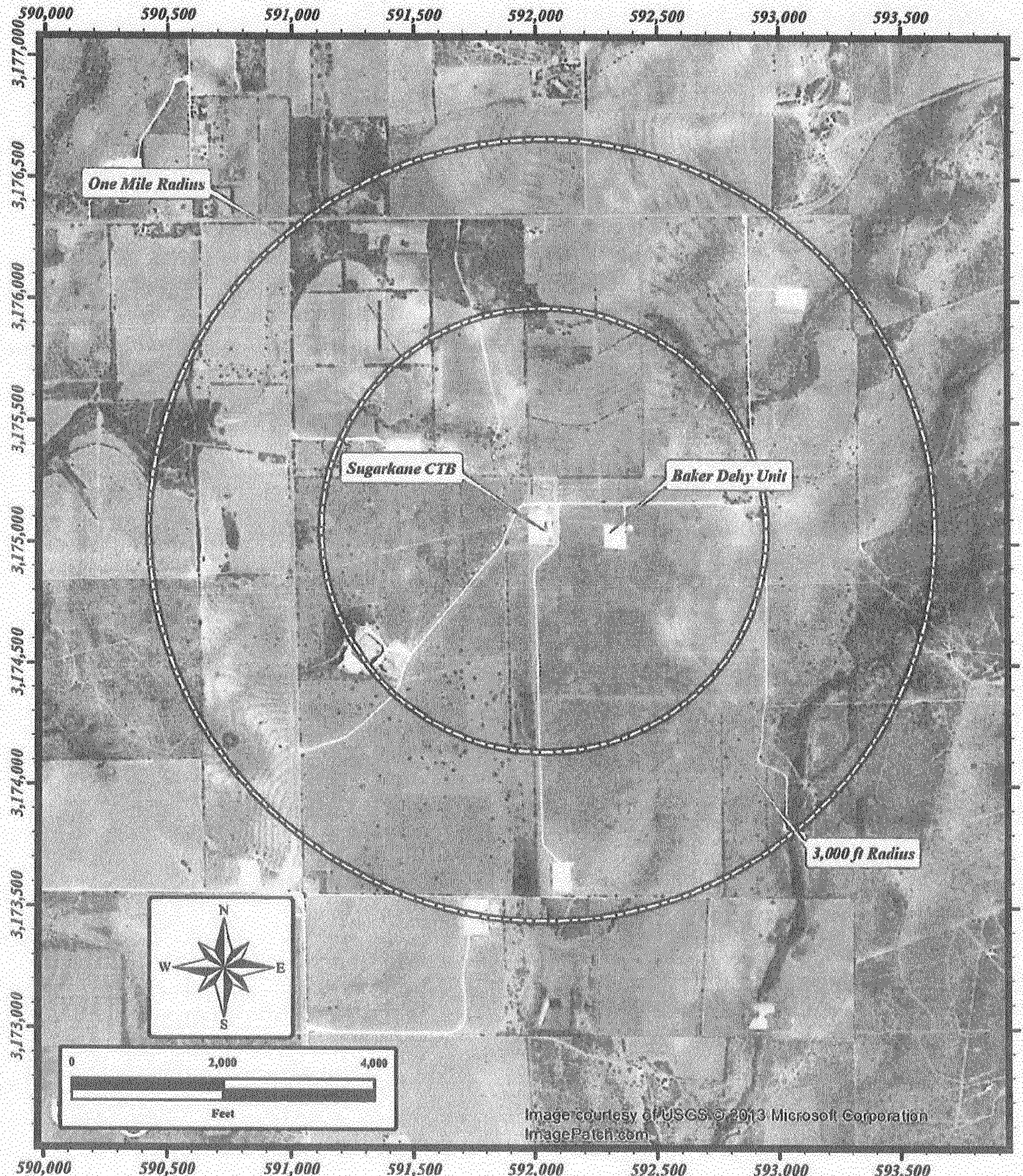
Scheduled Maintenance Startup and Shutdown Events

In accordance with TCEQ guidance and the non-rule Oil & Gas Standard Permit, a representation of planned Maintenance, Startup and Shutdown events are included in this Standard Permit registration in addition to the normal operating scenario.

It is conservatively planned that the VRU will be down for maintenance 8% of the year. During this time, any emissions from the liquids going to the storage tanks (FINs TK-01 throughTK-18) and being loaded out via truck (FINs TRUCK1 and TRUCK2) would be controlled by the flare (FIN FL-2-SMSS).

Additionally, during engine operational adjustments, the volume of gas in the compressor units will blow down, resulting in emissions. This blowdown event (FINs COMP-01-BD and COMP-02-BD) are captured and routed to the flare (FIN FL-1-SMSS) and emissions are controlled at a 98% capture and combustion efficiency. As this engine is brought back online, starter vent (FINs COMP-01-SV and COMP-02-SV) emissions occur to atmosphere as natural gas is routed through the engine as it builds up pressure.

Attachment 3 contains emission rate calculations for the air emission sources and a summary of the Site's emission rates.



Grid Presented is UTM Zone 14, NAD 1983

TITAN Engineering, Inc.
2801 Network Boulevard, Suite 200
Frisco, Texas 75034
Phone: (469) 365-1100 Fax: (469) 365-1199
www.titanengineering.com y www.apexcos.com
A Division of Apex Companies, LLC

FIGURE 1-1 AREA MAP

Burlington Resources Oil & Gas Company LP
Standard Permit Registration
Sugarkane CTB - Baker Dehy Unit
TITAN Project No. 84800507-78
February 2013
from USGS Quadrangle Pawnee, Texas
Ground Condition Depicted October 2011
Digital Data Courtesy of ESRI Online Datasets

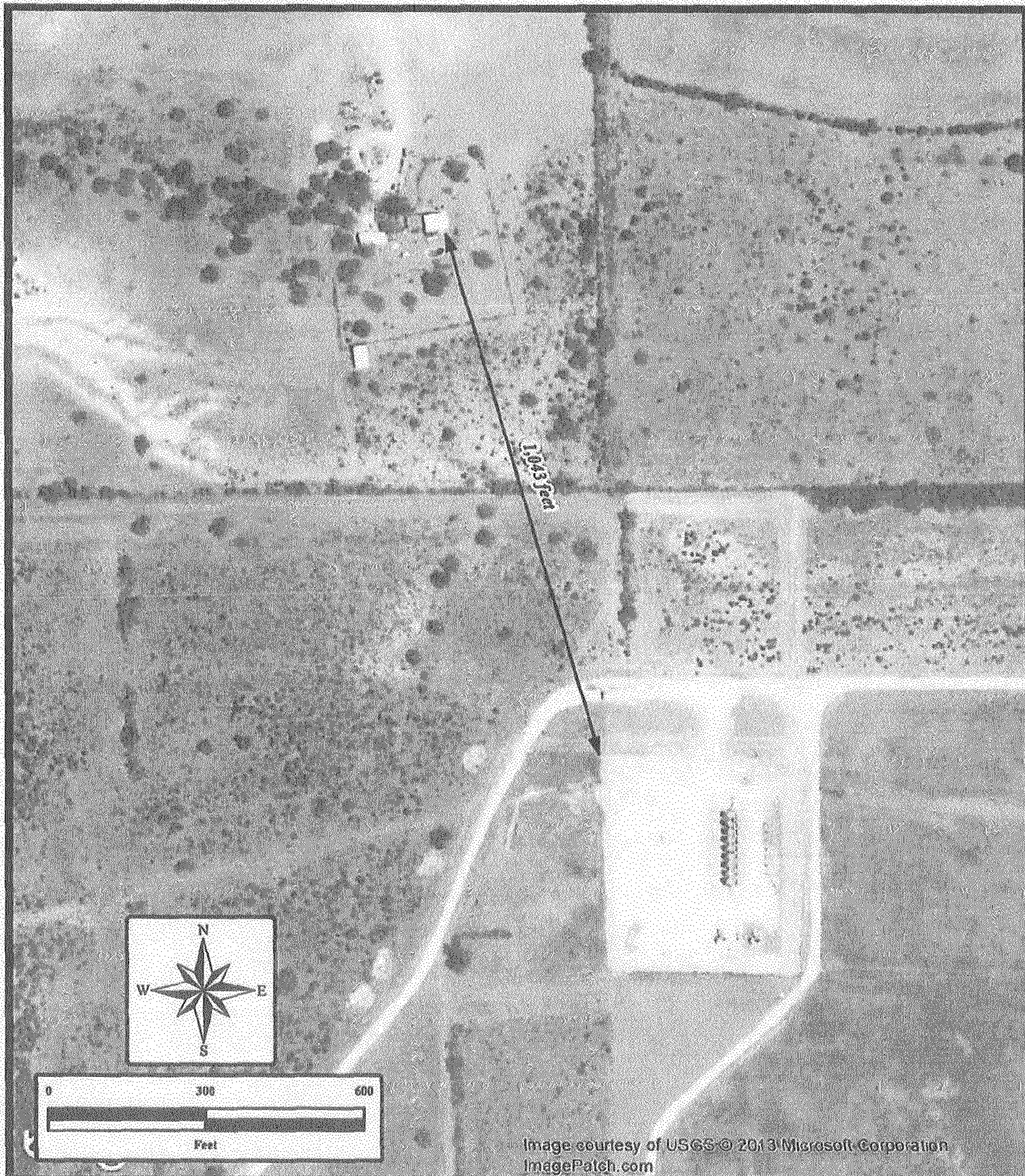


FIGURE 1-2 RECEPTOR MAP

Burlington Resources Oil & Gas Company LP
Standard Permit Registration
Sugarkane CTB - Baker Dehy Unit
TITAN Project No. 84800507-78
February 2013
from USGS Quadrangle Pawnee, Texas
Ground Condition Depicted October 2011
Digital Data Courtesy of ESRI Online Datasets

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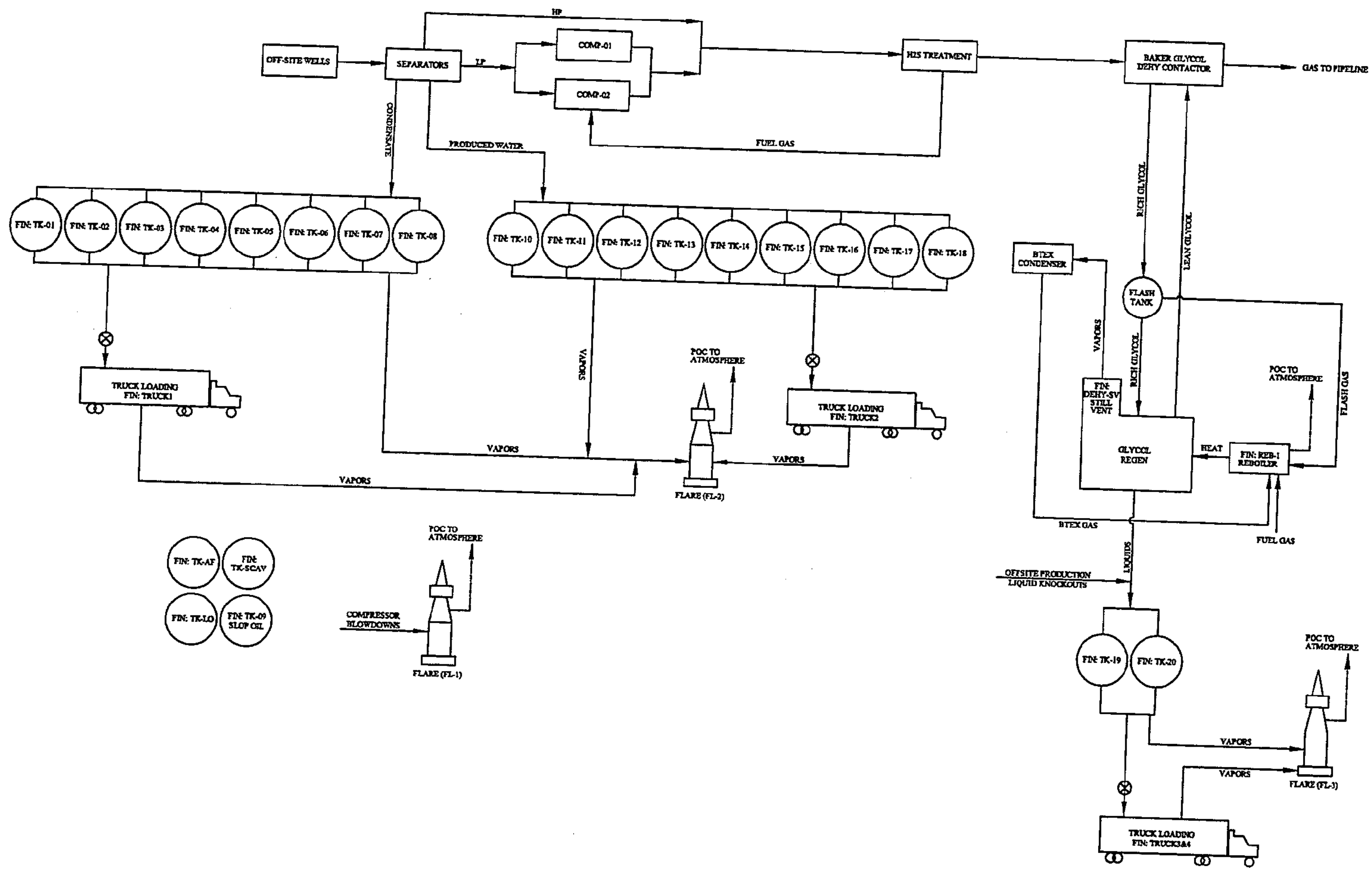

NOTES

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FIGURE 1-3
SIMPLIFIED PROCESS
FLOW DIAGRAM

Burlington Resources
Oil & Gas Company L.P.
Sugarkane CTB - Baker Dehy
Standard Permit Registration

DESIGNED BY: Burlington	DETAILED BY: LLA	CHECKED BY: CIC
FILE NAME: T:\ConocoPhillips\507-78SugarkanePermit\CAD		
DATE: 03/2013	PROJECT NO.: 84800507-78	PLOT SCALE: NTS
DRAWING NO.: TEI-0000	REVISION: 0	FIGURE: 1-3

ATTACHMENT 2
TCEQ FORMS AND TABLES

OIL AND GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB – BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TCEQ

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (If other is checked please describe in space provided)

☑ New Permit, Registration or Authorization (Core Data Form should be submitted with the program application)

☐ Renewal (Core Data Form should be submitted with the renewal form) ☐ Other

2. Attachments **Describe Any Attachments:** (ex. Title V Application, Waste Transporter Application, etc.)

☑Yes ☐No | Oil and Gas Standard Permit Registration

3. Customer Reference Number (if issued)	Follow this link to search for CN or RN numbers in Central Registry**	4. Regulated Entity Reference Number (if issued)
CN 602989436		RN 105698112

SECTION II: Customer Information

5. Effective Date for Customer Information Updates (mm/dd/yyyy)

6. Customer Role (Proposed or Actual) – as it relates to the Regulated Entity listed on this form. Please check only one of the following:

☐Owner ☐ Operator ☑ Owner & Operator
☐Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐Other: ______

7. General Customer Information

☐ New Customer ☐ Update to Customer Information ☑ Change in Regulated Entity Ownership
☐Change in Legal Name (Verifiable with the Texas Secretary of State) ☐ No Change**

**If "No Change" and Section I is complete, skip to Section III – Regulated Entity Information.

8. Type of Customer:	☑ Corporation	☐ Individual	☐ Sole Proprietorship- D.B.A
☐ City Government	☐ County Government	☐ Federal Government	☐ State Government
☐ Other Government	☐ General Partnership	☐ Limited Partnership	☐ Other:

9. Customer Legal Name (If an individual, print last name first: ex: Doe, John)	If new Customer, enter previous Customer below	End Date:
Burlington Resources Oil & Gas Company LP	ConocoPhillips Company	

10. Mailing Address:	600 N DAIRY ASHFORD RD						
	Westlake 3, 15012						
	City	HOUSTON	State	TX	ZIP	77079	ZIP + 4

11. Country Mailing Information (if outside USA)	12. E-Mail Address (if applicable)

13. Telephone Number	14. Extension or Code	15. Fax Number (if applicable)
8324866508		8324866431

16. Federal Tax ID (9 digits)	17. TX State Franchise Tax ID (11 digits)	18. DUNS Number (if applicable)	19. TX SOS Filing Number (if applicable)
	32003073841	131117566	14500511

20. Number of Employees
☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☑ 501 and higher

21. Independently Owned and Operated?
☑ Yes ☐ No

SECTION III: Regulated Entity Information

22. General Regulated Entity Information (If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)

☐ New Regulated Entity ☑ Update to Regulated Entity Name ☑ Update to Regulated Entity Information ☐ No Change** (See below)

**If "NO CHANGE" is checked and Section I is complete, skip to Section IV, Preparer Information.

23. Regulated Entity Name (name of the site where the regulated action is taking place)

Sugarkane CTB - Baker Dehy Unit

24. Street Address of the Regulated Entity: (No P.O. Boxes)								
	City		State		ZIP		ZIP + 4	
25. Mailing Address:	600 N Dairy Ashford							
	Westlake 3, #15012							
	City	Houston	State	TX	ZIP	77079	ZIP + 4	
26. E-Mail Address:	james.woodall@conocophillips.com							

27. Telephone Number	28. Extension or Code	29. Fax Number (if applicable)
(832) 486-6508		832-486-6431

30. Primary SIC Code (4 digits)	31. Secondary SIC Code (4 digits)	32. Primary NAICS Code (5 or 6 digits)	33. Secondary NAICS Code (5 or 6 digits)
1311		211111	

34. What is the Primary Business of this entity? (Please do not repeat the SIC or NAICS description.)

Natural Gas Treatment

Questions 34 – 37 address geographic location. Please refer to the instructions for applicability.

35. Description to Physical Location:	From Whitsett TX, travel northeast on FM 99 for 4.9 miles. Continue straight on FM 1091/245 for 7.7 miles. Turn left onto FM 882 and travel 4.3. Turn right on Co Rd 246 and follow for 1.3 miles. Lease road will be on left. Follow lease road for 1.0 mile to Site entrance on left.

36. Nearest City	County	State	Nearest ZIP Code
Whitsett	Live Oak	TX	78119

37. Latitude (N) In Decimal:			38. Longitude (W) In Decimal:		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
28	41	57.74	98	3	28.16

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form or the updates may not be made. If your Program is not listed, check other and write it in. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Industrial Hazardous Waste	☐ Municipal Solid Waste
☑ New Source Review – Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS	☐ Sludge
☐ Stormwater	☐ Title V – Air	☐ Tires	☐ Used Oil	☐ Utilities
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	James Woodall	41. Title:	Sr. Environmental Specialist
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(832) 486-6508	N/A		james.woodall@conocophillips.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 9 and/or as required for the updates to the ID numbers identified in field 39.

(See the Core Data Form instructions for more information on who should sign this form.)

Company:	Burlington Resources Oil & Gas Company LP	Job Title:	Manager of Production Operations-GCBU
Name(In Print):	Randy Black	Phone:	(832) 486-6508
Signature:	RB	Date:	2/25/13

Texas Commission on Environmental Quality
Form PI-1S
Registrations for Air Standard Permit
(Page 1)

TCEQ

I. Registrant Information				
A. Is a TCEQ Core Data Form (TCEQ Form No. 10400) attached? Core Data Form required for Standard Permits 6004, 6006, 6007, 6008, and 6013.				☒ YES ☐ NO
Customer Reference Number (CN): CN602989436				
Regulated Entity Number (RN): RN105698112				
B. Company or Other Legal Customer Name (must be same as Core Data "Customer"): Burlington Resources Oil & Gas Company LP				
Company Official Contact Name: Randy Black				
Title: Manager of Production Operations - GCBU				
Mailing Address: 600 N Dairy Ashford, Westlake 3, #15012				
City: Houston	State: TX		ZIP Code: 77079	
Phone No.: 832-486-6508	Fax No.: 832-486-6431		E-mail Address: randy.c.black@conocophillips.com	
C. Technical Contact Name: James Woodall				
Title and Company: Sr. Environmental Specialist				
Mailing Address: 600 N Dairy Ashford, Westlake 3, #15012				
City: Houston	State: TX		ZIP Code: 77079	
Phone No.: 832-486-6508	Fax No.: 832-486-6431		E-mail Address: james.woodall@conocophillips.com	
D. Facility Location Information (Street Address):				
If no street address, provide clear driving directions to the site in writing:				
From Whitsett TX, travel northeast on FM 99 for 4.9 miles. Continue straight on FM 1091/245 for 7.7 miles. Turn left onto FM 882 and travel 4.3. Turn right on Co Rd 246 and follow for 1.3 miles. Lease road will be on left. Follow lease road for 1.0 mile to Site entrance on left.				
City: Whitsett	County: Live Oak		ZIP Code: 78119	
Latitude (nearest second): 28°41'57.74"N		Longitude (nearest second): 98° 3'28.16"W		
II. Facility and Site Information				
A. Name and Type of Facility: Sugarkane CTB - Baker Dehy Unit			☒ Permanent ☐ Temporary	
B. Type of Action:				
☒ Initial Application	☐ Renewal		☐ Change to Registration	
☒ Registration No.: 96022, 108166		☐ Expiration Date:		
C. List the Standard Permit Claimed: 6002				
Description: Oil and Gas Facilities				

TCEQ

Texas Commission on Environmental Quality
Registrations for Air Standard Permit
PI-1S
(Page 2)

II. Facility and Site Information *(continued)*		
D. Concrete Batch Plant Standard Permit *(Check one)* ☐ Central Mix ☐ Ready Mix ☐ Specialty Mix ☐ Enhanced Controls for Concrete Batch Plants		
E. Proposed Start of Construction:	Length of Time at the Site:	
F. Is there a previous Standard Exemption or Permit by Rule for the facilities in this registration? *(Attach details regarding changes)*	☒ YES ☐ NO	
If "YES," list Permit No.: 87682		
G. Are there any other facilities at this site which are authorized by an air Standard Permit?	☐ YES ☒ NO	
If "YES," list Permit No.:		
H. Are there any other air preconstruction permits at this site?	☐ YES ☒ NO	
If "YES," list Permit No.:		
Are there any other air preconstruction permits at this site that would be directly associated with this project?	☐ YES ☒ NO	
If "YES," list Permit No.:		
I. TCEQ Account Identification Number (if known):		
J. Is this facility located at a site which is required to obtain a federal operating permit pursuant to 30 TAC Chapter 122?	☐ YES ☒ NO ☐ To Be Determined	
K. Identify the requirements of 30 TAC Chapter 122 that will be triggered if this Form PI-1S application is approved.		
☐ Application for an FOP	☐ FOP Significant Revision	☐ FOP Minor
☐ Operational Flexibility/Off-Permit Notification		☐ Streamlined Revision for GOP
☐ To Be Determined		☒ None
L. Identify the type(s) issued and/or FOP application(s) submitted/pending for the site. *(check all that apply)*		
☐ SOP ☐ GOP ☐ GOP Application/Revision Application: Submitted or Under APD Review		
☐ SOP Application Review Application: Submitted or Under APD Review		☒ N/A

Texas Commission on Environmental Quality
Registrations for Air Standard Permit
PI-1S
(Page 3)

III. Fee Information	
A. Is a copy of the check or money order attached?	☒ YES ☐ NO
Check/Money Order/Transaction Number: 25204	
Company name on Check: TITAN Engineering, Inc.	
Fee Amount: $850.00	
IV. Public Notice *(If Applicable)*	
A. Is the plant located at a site contiguous or adjacent to the public works project?	☐ YES ☐ NO
B. Name of Public Place:	
Physical Address:	
City:	County:
C. Small Business Classification:	☐ YES ☐ NO
D. Concrete batch plants with enhanced controls, permanent rock crushers, and animal carcass incinerators shall place a copy of the technically complete application at the appropriate TCEQ regional office only.	
E. Please furnish the names of the state legislators who represent the area where the facility site is located:	
State Senator:	
State Representative:	
F. For Concrete Batch Plants, name of the County Judge for this facility site:	
County Judge:	
Mailing Address:	
City:	State: ZIP Code:
G. For Concrete Batch Plants, is the facility located in a municipality and/or extraterritorial jurisdiction of a municipality?	☐ YES ☐ NO
If "YES," list the name(s) of the Presiding Officer(s) for the municipality and/or extraterritorial jurisdiction:	
Presiding Officer(s):	
Title:	
Mailing Address:	
City:	State: ZIP Code:

Texas Commission on Environmental Quality
Registration for Air Standard Permit
Form PI-1S
(Page 4)

TCEQ

V.	**Technical Information Including State and Federal Regulatory Requirements** **Registrants must be in compliance with all applicable state and federal regulations and standards to claim a Standard Permit.**	
A.	Is confidential information submitted and properly marked with this registration?	☐ YES ☒ NO
B.	Is a process flow diagram and a process description attached?	☒ YES ☐ NO
C.	Is a plot plan attached?	☒ YES ☐ NO
D.	Are emissions data and calculations for this claim attached?	☒ YES ☐ NO
E.	Is information attached showing how the general requirements and applicability (30 TAC 116.610 and 116.615) are met?	☒ YES ☐ NO
F.	Is information attached showing how the specific requirements are met?	☒ YES ☐ NO
VI.	**Delinquent Fees and Penalties**	

This form **will not be processed** until all delinquent fees and/or penalties owed to the TCEQ or the Office of the Attorney General on behalf of the TCEQ is paid in accordance with the Delinquent Fee and Penalty Protocol. For more information regarding Delinquent Fees and Penalties, go to the TCEQ Web site at: www.tceq.texas.gov/agency/delin/index.html.

VII. Signature Requirements

The signature below indicates that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. I further state that to the best of my knowledge and belief, the project for which application is made will not in any way violate any provision of the Texas Water Code (TWC), Chapter 7, Texas Clean Air Act (TCAA), as amended, or any of the air quality rules and regulations of the Texas Commission on Environmental Quality or any local governmental ordinance or resolution enacted pursuant to the TCAA. I further state that I have read and understand TWC 7.177 and 7.183, which defines ***Criminal Offenses*** for certain violations, including intentionally or knowingly making or causing to be made false material statements or representations in this application, and TWC 7.187, pertaining to ***Criminal Penalties***.

Name: Randy Black
Print Full Name

Signature: RB
Original Signature Required

Date: 7/25/13

CASH ONLY IF ALL CheckLock™ SECURITY FEATURES LISTED ON BACK INDICATE NO TAMPERING OR COPYING

TITAN ENGINEERING, INC.
2801 NETWORK BLVD, SUITE 200
FRISCO, TX 75034

BANK OF TEXAS, NA
DALLAS, TX
32-1432/1110

25204

3/4/2013

PAY TO THE ORDER OF TCEQ $ **850.00

Eight Hundred Fifty and 00/100*** DOLLARS

Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

VOID AFTER 90 DAYS

MEMO Agency Fee: 84800507-78.001

⑈025204⑈ ⑆111014325⑆ ⑈8092671152⑈

Intuit® CheckLock™ Secure Check Details on Back

TITAN ENGINEERING, INC. 25204

TCEQ 3/4/2013

Date	Type	Reference	Original Amt.	Balance Due	Discount	Payment
3/4/2013	Bill	84800507-78.001	850.00	850.00		850.00
					Check Amount	850.00

Bank of Texas Operati Agency Fee: 84800507-78.001 850.00

Texas Commission on Environmental Quality

OGS New Project Notification for New Registration

Site Information (Regulated Entity)

What is the name of the site to be authorized?	Sugarkane CTB - Baker Dehy Unit
Does the site have a physical address?	
County	LIVE OAK
Latitude (N) (##.######)	28.699372
Longitude (W) (-###.######)	-98.058222
Primary SIC Code	1311
Secondary SIC Code	
Primary NAICS Code	211111
Secondary NAICS Code	
Regulated Entity Site Information	
What is the Regulated Entity's Number (RN)?	RN105698112
What is the name of the Regulated Entity (RE)?	SUGARKANE CENTRAL BATTERY 1
Does the RE site have a physical address?	No
Because there is no physical address, describe how to locate this site:	FROM PAWNEE GO 1.0 MI N ON HWY 72 TO FM 882 GO APPROX 10.5 MI ON FM 882 TURN R ON LEASE RD GO APPROX 1.0 MI DOWN LEASE RD TO SITE
City	PAWNEE
State	TX
ZIP	78145
County	LIVE OAK
Latitude (N) (##.######)	
Longitude (W) (-###.######)	
What is the primary business of this entity?	NATURAL GAS PRODUCTION FACILITY

Burling-Customer (Applicant) Information

How is this applicant associated with this site?	Owner Operator
What is the applicant's Customer Number (CN)?	CN602989436
Type of Customer	Corporation
Full legal name of the applicant:	
Legal Name	Burlington Resources Oil & Gas Company LP
Texas SOS Filing Number	14500511

Federal Tax ID	
State Franchise Tax ID	32003073841
DUNS Number	131117566
Number of Employees	501+
Independently Owned and Operated?	Yes
I certify that the full legal name of the entity applying for this permit has been provided and is legally authorized to do business in Texas.	Yes
Responsible Authority Contact	
Organization Name	Burlington Resources Oil & Gas Company LP
Prefix	MR
First	James
Middle	
Last	Woodall
Suffix	
Title	Sr. Environmental Specialist
Responsible Authority Mailing Address	
Enter new address or copy one from list:	
Address Type	Domestic
Mailing Address (include Suite or Bldg. here, if applicable)	600 N DAIRY ASHFORD RD
Routing (such as Mail Code, Dept., or Attn:)	Westlake 3, 15012
City	HOUSTON
State	TX
ZIP	77079
Phone (###-###-####)	8324866508
Extension	
Alternate Phone (###-###-####)	8324866508
Fax (###-###-####)	
E-mail	james.woodall@conocophillips.com

Responsible Official Contact

Person TCEQ should contact for questions about this application:	
Same as another contact?	Burlington Resources Oil & Gas Company LP
Organization Name	Burlington Resources Oil & Gas Company LP
Prefix	MR
First	Randy

Middle	
Last	Black
Suffix	
Title	Sr. Environmental Specialist
Enter new address or copy one from list:	Burlington Resources Oil & Gas Company LP
Mailing Address	
Address Type	Domestic
Mailing Address (include Suite or Bldg. here, if applicable)	600 N DAIRY ASHFORD RD
Routing (such as Mail Code, Dept., or Attn:)	Westlake 3, 15012
City	HOUSTON
State	TX
ZIP	77079
Phone (###-###-####)	8324866508
Extension	
Alternate Phone (###-###-####)	8324866508
Fax (###-###-####)	
E-mail	randy.c.black@conocophillips.com

Technical Contact

Person TCEQ should contact for questions about this application:	
Same as another contact?	Burlington Resources Oil & Gas Company LP
Organization Name	Burlington Resources Oil & Gas Company LP
Prefix	MR
First	James
Middle	
Last	Woodall
Suffix	
Title	Sr. Environmental Specialist
Enter new address or copy one from list:	Burlington Resources Oil & Gas Company LP
Mailing Address	
Address Type	Domestic
Mailing Address (include Suite or Bldg. here, if applicable)	600 N DAIRY ASHFORD RD
Routing (such as Mail Code, Dept., or Attn:)	Westlake 3, 15012
City	HOUSTON
State	TX

ZIP	77079
Phone (###-###-####)	8324866508
Extension	
Alternate Phone (###-###-####)	8324866508
Fax (###-###-####)	
E-mail	james.woodall@conocophillips.com

OGS New Project Notification

1) Select the authorization this site or changes to this site will most likely be authorized under based on expected worst-case operations (including planned MSS actlvities if MSS emissions are being registered with this project).	6002 - NON RULE 2012-NOV-08
2) What is the lease name submitted to the Railroad Commission (RRC)? If there are well(s) co-located with the site, include the well number(s) assigned by the RRC.	NA
3) Provide a brief process description for this site or description of changes to this site.	The site will collect hydrocarbon liquids from nearby wells. Low pressure gas will be sent to compression, routed to a dehydration unit and sent down the pipeline. Hydrocarbon liquids are collected and sent offsite periodically.
4) What is the site's latitude? (North)	28.699372
5) What is the site's longitude? (West)	-98.057822
6) What method was used to determine the site's latitude and longitude?	Map
7) Does this business qualify as a small business, non-profit organization, or small government entity?	No

Signature

The signature below indicates to the best of my knowledge that the information submitted is true and complete, and that I have signature authority to submit this application on behalf of the regulated entity.

1. I am James Woodall, the owner of the STEERS account ER020324.
2. I have the authority to sign this data on behalf of the applicant named above.
3. I have personally examined the foregoing and am familiar with its content and the content of any attachments, and based upon my personal knowledge and/or inquiry of any individual responsible for information contained herein, that this information is true, accurate, and complete.
4. I further certify that I have not violated any term in my TCEQ STEERS participation agreement and that I have no reason to believe that the confidentiality or use of my password has been compromised at any time.

5. I understand that use of my password constitutes an electronic signature legally equivalent to my written signature.
6. I also understand that the attestations of fact contained herein pertain to the implementation, oversight and enforcement of a state and/or federal environmental program and must be true and complete to the best of my knowledge.
7. I am aware that criminal penalties may be imposed for statements or omissions that I know or have reason to believe are untrue or misleading.
8. I am knowingly and intentionally signing OGS New Project Notification for New Registration.
9. My signature indicates that I am in agreement with the information on this form, and authorize its submittal to the TCEQ.

OWNER OPERATOR Signature: James Woodall OWNER OPERATOR

Account Number:	ER020324
Signature IP Address:	138.32.80.20
Signature Date:	2013-02-08
Signature Hash:	AA06BD67D3B72ED49336BE1B65B794CDB78BFA0ECB7C0D5E82BDCEE54CEC562C
Form Hash Code at time of Signature:	71DC2B12E9B33922429868A7B91AEA01BCF588C08F2AA84592EFCF690AF1441B

Fee Payment

Transaction by:	The application fee payment transaction was made by ER025071/Christina I Chermak
Paid by:	The application fee was paid by CHRISTINA CHERMAK
Fee Amount:	$50.00
Paid Date:	The application fee was paid on 2013-02-08
Transaction/Voucher number:	The transaction number is 582EA000135659 and the voucher number is 171262

Submission

Reference Number:	The application reference number is 60183
Submitted by:	The application was submitted by ER025071/Christina I Chermak
Submitted Timestamp:	The application was submitted on 2013-02-08 at 10:27:19 CST
Submitted From:	The application was submitted from IP address 12.237.12.100
Confirmation Number:	The confirmation number is 64090
Steers Version:	The STEERS version is 5.87

Additional Information

Application Creator: This account was created by Christina I Chermak

TCEQ

Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

I. Engine Data

Manufacturer:	Model No.	Serial No.	Manufacture Date:
Caterpillar	G3508TALE	411498	9/12/2008
Rebuilds Date:	**No. of Cylinders:**	**Compression Ratio:**	**EPN:**
NA	16	8:1	COMP-01

Application: ☒ Gas Compression ☐ Electric Generation ☐ Refrigeration ☐ Emergency/Stand by

☒ 4 Stroke Cycle ☐ 2 Stroke Cycle ☒ Carbureted ☒ Spark Ignited ☐ Dual Fuel ☐ Fuel Injected

☐ Diesel ☐ Naturally Aspirated ☐ Blower /Pump Scavenged ☒ Turbo Charged and I.C. ☒ Turbo Charged

☐ Intercooled ☐ I.C. Water Temperature ☒ Lean Burn ☐ Rich Burn

Ignition/Injection Timing: Fixed: Variable:

Manufacture Horsepower Rating: 670 Proposed Horsepower Rating: 502-670

Discharge Parameters

Stack Height (Feet)	Stack Diameter (Feet)	Stack Temperature (°F)	Exit Velocity (FPS)
20	1.0	985	86.71

II. Fuel Data

Type of Fuel: ☒ Field Gas ☐ Landfill Gas ☐ LP Gas ☐ Natural Gas ☐ Digester Gas ☐ Diesel

Fuel Consumption (BTU/bhp-hr): 7510 Heat Value: (HHV) (LHV)

Sulfur Content (grains/100 scf - weight %): 10 ppm

III. Emission Factors (Before Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM10	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv

Source of Emission Factors: ☐ Manufacturer Data ☐ AP-42 ☐ Other (specify):

IV. Emission Factors (Post Control)

NO_X		CO		SO2		VOC		Formaldehyde		PM10	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
2.0		3.0				1.0					

Method of Emission Control: ☐ NSCR Catalyst ☒ Lean Operation ☐ Parameter Adjustment

☐ Stratified Charge ☐ JLCC Catalyst ☒ Other (Specify): SCR Catalvst

***Note:** Must submit a copy of any manufacturer control information that demonstrates control efficiency.*

Is Formaldehyde included in the VOCs? ☒ Yes ☐ No

V. Federal and State Standards (Check all that apply)

☒ NSPS JJJJ ☒ MACT ZZZZ ☐ NSPS IIII ☐ Title 30 Chapter 117 - List County: ______

VI. Additional Information

1. Submit a copy of the engine manufacturer's site rating or general rating specification data.
2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.
3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).

Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

TCEQ

I. Engine Data			
Manufacturer: Caterpillar	Model No. G3508 TALE	Serial No. 410776	Manufacture Date: 1/15/2004
Rebuilds Date: NA	No. of Cylinders: 16	Compression Ratio: 8:1	EPN: COMP-02

Application: ☒ Gas Compression ☐ Electric Generation ☐ Refrigeration ☐ Emergency/Stand by

☒ 4 Stroke Cycle ☐ 2 Stroke Cycle ☒ Carbureted ☒ Spark Ignited ☐ Dual Fuel ☐ Fuel Injected

☐ Diesel ☐ Naturally Aspirated ☐ Blower /Pump Scavenged ☒ Turbo Charged and I.C. ☒ Turbo Charged

☐ Intercooled ☐ I.C. Water Temperature ☒ Lean Burn ☐ Rich Burn

Ignition/Injection Timing: Fixed: | Variable:

Manufacture Horsepower Rating: 630 | Proposed Horsepower Rating: 473-630

Discharge Parameters

Stack Height (Feet)	Stack Diameter (Feet)	Stack Temperature (°F)	Exit Velocity (FPS)
20	1.0	856	73.95

II. Fuel Data

Type of Fuel: ☒ Field Gas ☐ Landfill Gas ☐ LP Gas ☐ Natural Gas ☐ Digester Gas ☐ Diesel

Fuel Consumption (BTU/bhp-hr): 7820 | Heat Value: (HHV) | (LHV)

Sulfur Content (grains/100 scf - weight %): 10 ppm

III. Emission Factors (Before Control)

NO_X		CO		SO_2		VOC		Formaldehyde		PM10	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
2.0		3.0				1.0		0.42			

Source of Emission Factors: ☒ Manufacturer Data ☐ AP-42 ☐ Other (specify):

IV. Emission Factors (Post Control)

NO_X		CO		SO2		VOC		Formaldehyde		PM10	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv

Method of Emission Control: ☐ NSCR Catalyst ☒ Lean Operation ☐ Parameter Adjustment

☐ Stratified Charge ☐ JLCC Catalyst ☒ Other (Specify): Air-Fuel Ratio Control

Note: Must submit a copy of any manufacturer control information that demonstrates control efficiency.

Is Formaldehyde included in the VOCs? ☒ Yes ☐ No

V. Federal and State Standards (Check all that apply)

☐ NSPS JJJJ ☒ MACT ZZZZ ☐ NSPS IIII ☐ Title 30 Chapter 117 - List County: ____________

VI. Additional Information

1. Submit a copy of the engine manufacturer's site rating or general rating specification data.
2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.
3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emissions Point Summary

Permit Number:	108166	RN Number:	RN105698112	Date:	February 2013
Company Name:	Burlington Resources Oil & Gas Company LP - SUGARKANE CTB - BAKER DEHY UNIT				

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA						EMISSION POINT DISCHARGE PARAMETERS										
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emissinn Rate		4. UTM Coordinates of Emission Point			5. Building Height (ft)	6. Height Above Ground (ft)	Source					
											7. Stack Exit Data			8. Fugitives		
EPN (A)	FIN (B)	NAME (C)		Pounds per Hour (A)	TPY (B)	Zone	East (meters)	Narth (meters)			Diameter (ft) (A)	Velocity (fps) (B)	Temperature (°F) (C)	Length (ft) (A)	Width (ft) (B)	Axis Degrees (C)
Normal Operations																
COMP-01	COMP-01	Compressor Engine 1	CO	4.43	19.40	14	--	--	--	20.0	1.0	86.71	985.0	--	--	--
			NOx	2.95	12.92											
			$PM/PM_{10}/PM_{2.5}$	0.05	0.22											
			SO2	0.01	0.04											
			VOC	1.48	6.48											
			CH2O	0.27	1.18											
			Benzene	0.01	0.04											
COMP-02	COMP-02	Compressor Engine 2	CO	4.17	18.26	14	--	--	--	20.0	1.0	73.95	856.0	--	--	--
			NOx	2.78	12.18											
			$PM/PM_{10}/PM_{2.5}$	0.004	0.02											
			SO2	0.001	0.004											
			VOC	1.39	6.09											
			CH2O	0.58	2.54											
			Benzene	0.006	0.03											
FUG	FUG	Site Fugitives	VOC	2.00	8.79	14	--	--	--	3.0	--	--	--	--	--	--
			Benzene	0.02	0.09											
			H_2S	0.001	0.004											
REB-1	REB-1	Glycol Reboiler No. 1	CO	0.04	0.18	14	--	--	--	14.3	--	--	--	--	--	--
			NOx	0.05	0.22											
			$PM/PM_{10}/PM_{2.5}$	0.004	0.02											
			SO_2	0.001	0.004											
			VOC	0.003	0.01											
			Benzene	0.000001	0.000004											
			CH_2O	0.00004	0.0002											
REB-1	DEHY-SV	Glycol Dehy Still Vent	VOC	0.78	3.41	14	--	--	--	14.3	--	--	--	--	--	--
			Benzene	0.04	0.17											
			H_2S	0.01	0.05											
FL-3	TK-19	Condensate Starage Tank at Baker	VOC	1.47	5.15	14	--	--	--	25.0	--	--	--	--	--	--
			Benzene	0.005	0.01											
			H_2S	0.0002	0.001											
FL-3	TK-20	Produced Water Storage Tank at Baker	VOC	0.04	0.00	14	--	--	--	25.0	--	--	--	--	--	--
			Benzene	0.0002	0.001											
			H_2S	0.00001	0.00004											
TK-AF	TK-AF	Antifreeze Liquid Storage	VOC	0.50	0.01	14	--	--	--	--	--	--	--	--	--	--
TK-LO	TK-LO	Lube Oil Liquid Storage	VOC	0.0002	0.000002	14	--	--	--	--	--	--	--	--	--	--
TK-SCAV	TK-SCAV	H2S Scavenger Liquid Storage	VOC	<0.01	<0.01	14	--	--	--	--	--	--	--	--	--	--
VRU	TRUCK1	Controlled Condensate and Slop Tank Truck Loading (Sugarkane)	VOC	0.63	0.47	14	--	--	--	25.0	--	--	--	--	--	--
			Benzene	0.003	0.002											
VRU	TRUCK2	Controlled Produced Water Tank Truck Loading (Sugarkane)	VOC	0.01	0.002	14	--	--	--	25.0	--	--	--	--	--	--
			Benzene	0.0001	0.00001											

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table I(a) Emissions Point Summary

Permit Number:	108166	RN Number:	RN105698112	Date:	February 2013
Company Name:	Burlington Resources Oil & Gas Company LP - SUGARKANE CTB - BAKER DEHY UNIT				

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA						EMISSION POINT DISCHARGE PARAMETERS										
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate		4. UTM Coordinates of Emission Point			Source							
									5. Building Height (ft)	6. Height Above Ground (ft)	7. Stack Exit Data			8. Fugitives		
EPN (A)	FIN (B)	NAME (C)		Pounds per Hour (A)	TPY (B)	Zone	East (meters)	North (meters)			Diameter (ft) (A)	Velocity (fps) (B)	Temperature (°F) (C)	Length (ft) (A)	Width (ft) (B)	Axis Degrees (C)
FL-3	TRUCK3	Controlled Condensate Tank Truck Loading (Baker)	VOC	1.58	0.72	14	--	--	--	30.0	--	--	--	--	--	--
			Benzene	0.01	0.003											
FL-3	TRUCK4	Controlled Produced Water Tank Truck Loading (Baker)	VOC	0.02	0.003	14	--	--	--	30.0	--	--	--	--	--	--
			Benzene	0.0001	0.00001											
FL-1	FL-1	Flare 1 Combustion (assist, and pilot)	CO	0.45	1.97	14	--	--	--	30.0	--	--	--	--	--	--
			NO_X	0.22	0.97											
			SO_2	0.03	0.13											
			H_2S	0.00001	0.00004											
			VOC	0.01	0.04											
			Benzene	0.000003	0.00001											
FL-2	FL-2	Flare 2 Combustion (assist, and pilot)	CO	0.45	1.97	14	--	--	--	30.0	--	--	--	--	--	--
			NO_X	0.22	0.97											
			SO_2	0.03	0.13											
			H_2S	0.00001	0.00004											
			VOC	0.01	0.04											
			Benzene	0.000003	0.00001											
FL-3	FL-3	Flore 3 Combustion (normal operations waste gas, assist, and pilot)	CO	1.62	4.70	14	--	--	--	30.0	--	--	--	--	--	--
			NO_X	0.81	2.34											
			SO_2	0.04	0.15											
			H_2S	0.0001	0.0002											
			VOC	0.01	0.04											
			Benzene	0.000003	0.00001											
Scheduled Maintenance Startup and Shutdown Events																
COMP-01-SV	COMP-01-SV	Compressor Engine 1 Starter Vent	VOC	16.88	0.44	14	--	--	--	20.0	--	--	--	--	--	--
			Benzene	0.07	0.002											
			H_2S	0.02	0.0004											
FL-1-SMSS	COMP-01-BD	Compressor Engine 1 Blowdown	VOC	0.26	0.01	14	--	--	--	30.0	--	--	--	--	--	--
			Benzene	0.001	0.00002											
			H_2S	0.0002	0.00001											
COMP-02-SV	COMP-02-SV	Compressor Engine 2 Starter Vent	VOC	16.88	0.44	14	--	--	--	20.0	--	--	--	--	--	--
			Benzene	0.07	0.002											
			H_2S	0.02	0.02											
FL-1-SMSS	COMP-02-BD	Compressor Engine 2 Blowdown	VOC	0.24	0.01	14	--	--	--	30.0	--	--	--	--	--	--
			Benzene	0.001	0.00002											
			H_2S	0.0002	0.00001											
FL-2-SMSS	TK-01 through TK-08	Controlled Condensate Tanks Emissions (during VRU downtime)	VOC	2.14	1.10	14	--	--	--	30.0	--	--	--	--	--	--
			Benzene	0.01	0.004											
			H_2S	0.0004	0.0002											
FL-2-SMSS	TK-09	Controlled Slop Tank Emissions (during VRU downtime)	VOC	0.18	0.05	14	--	--	--	30.0	--	--	--	--	--	--
			Benzene	0.001	0.0002											

TCEQ-10153 (Revised 01-15-03)
Table 1(a) - Emission Point Summary - These forms are for use by sources subject to the New Source Review Program and may be revised [ANSRG95A:7026.v2]

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emissions Point Summary

Permit Number:	108166	RN Number:	RN105698112	Date:	February 2013
Company Name:	Burlington Resources Oil & Gas Company LP - SUGARKANE CTB - BAKER DEHY UNIT				

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA						EMISSION POINT DISCHARGE PARAMETERS											
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate		4. UTM Coordinates of Emission Point			5. Building Height (ft)	6. Height Above Ground (ft)	Source						
											7. Stack Exit Data			8. Fugitives			
EPN (A)	FIN (B)	NAME (C)		Pounds per Hour (A)	TPY (B)	Zone	East (meters)	North (meters)			Diameter (ft) (A)	Velocity (fps) (B)	Temperature (°F) (C)	Length (ft) (A)	Width (ft) (B)	Axis Degrees (C)	
FL-2-SMSS	TK-10 through TK-18	Controlled Produced Water Tank Emissions (during VRU downtime)	VOC Benzene H_2S	0.08 0.0002 0.00002	0.03 0.0001 0.00001	14	--	--	--	30.0	--	--	--	--	--	--	
FL-2-SMSS	TRUCK1	Controlled Condensate and Slop Tank Truck Loading at Sugarkane (during VRU downtime)	VOC Benzene	1.58 0.01	0.09 0.0004	14	--	--	--	30.0	--	--	--	--	--	--	
FL-2-SMSS	TRUCK2	Controlled Produced Water Tank Truck Loading at Sugarkane (during VRU downtime)	VOC Benzene	0.02 0.0001	0.0004 0.000002	14	--	--	--	30.0	--	--	--	--	--	--	
FL-1-SMSS	FL-1-SMSS	Flare 1 Combustion (Engine blowdown waste gas)	CO NO_X SO_2 H_2S	0.48 0.24 0.04 0.000	0.01 0.01 0.001 0.00001	14	--	--	--	30.0	--	--	--	--	--	--	
FL-2-SMSS	FL-2-SMSS	Flare 2 Combustion (Tanks waste gas during VRU downtime)	CO NO_X SO_2 H_2S	1.59 0.80 0.04 0.0004	0.58 0.30 0.02 0.0002	14	--	--	--	30.0	--	--	--	--	--	--	

TCEQ-10153 (Revised 01-15-03)
Table 1(a) - Emission Point Summary - These forms are for use by sources subject to the New Source Review Program and may be revised [ANSRG95A:7026,v2]

ATTACHMENT 3
EMISSION RATE CALCULATIONS

OIL AND GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB – BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TABLE 3-1
SUMMARY OF PROPOSED ALLOWABLE EMISSION RATES
OIL & GAS STANDARD PERMIT REGISTRATION
SUGARKANE CTB - BAKER DEHY UNIT
BURLINGTON RESOURCES OIL & GAS COMPANY LP

			Proposed Allowable Hourly and Annual Emission Rates															
			VOC		NO_X		CO		$PM/PM_{10}/PM_{2.5}$		SO_2		H_2S		CH_2O		Benzene	
EPN	FIN	Description	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)
Normal Operations																		
COMP-01	COMP-01	Compressor Engine 1	1.48	6.48	2.95	12.92	4.43	19.40	0.05	0.22	0.01	0.04	--	--	0.27	1.18	0.01	0.04
COMP-02	COMP-02	Compressor Engine 2	1.39	6.09	2.78	12.18	4.17	18.26	0.05	0.22	0.01	0.04	--	--	0.58	2.54	0.006	0.03
FUG	FUG	Site Fugitives	2.00	8.79	--	--	--	--	--	--	--	--	0.001	0.004	--	--	0.02	0.09
REB-1	REB-1	Glycol Reboiler No. 1	0.003	0.01	0.05	0.22	0.04	0.18	0.004	0.02	0.001	0.004	--	--	0.00004	0.0002	0.000001	0.000004
REB-1	DEHY-SV	Glycol Dehy Still Vent	0.78	3.41	--	--	--	--	--	--	--	--	0.01	0.05	--	--	0.04	0.17
FL-3	TK-19	Condensate Storage Tank at Baker	1.47	5.15	--	--	--	--	--	--	--	--	0.0002	0.001	--	--	0.005	0.01
FL-3	TK-20	Produced Water Storage Tank at Baker	0.04	0.17	--	--	--	--	--	--	--	--	0.00001	0.00004	--	--	0.0002	0.001
TK-AF	TK-AF	Antifreeze Liquid Storage	0.50	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TK-LO	TK-LO	Lube Oil Liquid Storage	0.0002	0.000002	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TK-SCAV	TK-SCAV	H_2S Scavenger Liquid Storage	<0.01	<0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VRU	TRUCK1	Controlled Condensate and Slop Tank Truck Loading (Sugarkane)	0.63	0.47	--	--	--	--	--	--	--	--	--	--	--	--	0.003	0.002
VRU	TRUCK2	Controlled Produced Water Tank Truck Loading (Sugarkane)	0.01	0.002	--	--	--	--	--	--	--	--	--	--	--	--	0.0001	0.00001
FL-3	TRUCK3	Controlled Condensate Tank Truck Loading (Baker)	1.58	0.72	--	--	--	--	--	--	--	--	--	--	--	--	0.01	0.003
FL-3	TRUCK4	Controlled Produced Water Tank Truck Loading (Baker)	0.02	0.003	--	--	--	--	--	--	--	--	--	--	--	--	0.0001	0.00001
FL-1	FL-1	Flare 1 Combustion (assist, and pilot)	0.01	0.04	0.22	0.97	0.45	1.97	--	--	0.03	0.13	0.00001	0.00004	--	--	0.000003	0.00001
FL-2	FL-2	Flare 2 Combustion (assist, and pilot)	0.01	0.04	0.22	0.97	0.45	1.97	--	--	0.03	0.13	0.00001	0.00004	--	--	0.000003	0.00001
FL-3	FL-3	Flare 3 Combustion (normal operations waste gas, assist, and pilot)	0.01	0.04	0.81	2.34	1.62	4.70	--	--	0.04	0.15	0.0001	0.0002	--	--	0.000003	0.00001
Scheduled Maintenance, Startup and Shutdown Events																		
COMP-01-SV	COMP-01-SV	Compressor Engine 1 Starter Vent	16.88	0.44	--	--	--	--	--	--	--	--	0.02	0.0004	--	--	0.07	0.002
FL-1-SMSS	COMP-01-BD	Compressor Engine 1 Blowdown	0.26	0.01	--	--	--	--	--	--	--	--	0.0002	0.00001	--	--	0.001	0.00002
COMP-02-SV	COMP-02-SV	Compressor Engine 2 Starter Vent	16.88	0.44	--	--	--	--	--	--	--	--	0.02	0.02	--	--	0.07	0.002
FL-1-SMSS	COMP-02-BD	Compressor Engine 2 Blowdown	0.24	0.01	--	--	--	--	--	--	--	--	0.0002	0.00001	--	--	0.001	0.00002
FL-2-SMSS	TK-01 through TK-08	Controlled Condensate Tanks Emissions (during VRU downtime)	2.14	1.10	--	--	--	--	--	--	--	--	0.0004	0.0002	--	--	0.01	0.004
FL-2-SMSS	TK-09	Controlled Slop Tank Emissions (during VRU downtime)	0.18	0.05	--	--	--	--	--	--	--	--	--	--	--	--	0.001	0.0002
FL-2-SMSS	TK-10 through TK-18	Controlled Produced Water Tank Emissions (during VRU downtime)	0.08	0.03	--	--	--	--	--	--	--	--	0.00002	0.00001	--	--	0.0002	0.0001
FL-2-SMSS	TRUCK1	Controlled Condensate and Slop Tank Truck Loading at Sugarkane (during VRU downtime)	1.58	0.09	--	--	--	--	--	--	--	--	--	--	--	--	0.01	0.0004
FL-2-SMSS	TRUCK2	Controlled Produced Water Tank Truck Loading at Sugarkane (during VRU downtime)	0.02	0.0004	--	--	--	--	--	--	--	--	--	--	--	--	0.0001	0.000002
FL-1-SMSS	FL-1-SMSS	Flare 1 Combustion (Engine blowdown waste gas)	--	--	0.24	0.01	0.48	0.01	--	--	0.04	0.001	0.0004	0.00001	--	--	--	--
FL-2-SMSS	FL-2-SMSS	Flare 2 Combustion (Tanks waste gas during VRU downtime)	--	--	0.80	0.30	1.59	0.58			0.04	0.02	0.0004	0.0002	--	--	--	--
		Site-Wide Emissions:	48.19	33.60	8.07	29.91	13.23	47.07	0.10	0.46	0.20	0.52	0.05	0.08	0.85	3.72	0.26	0.35

CALCULATION OF COMPRESSOR ENGINE POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			Engine Ratings			Annual				Potential to Emit (PTE)	
EPN	FIN	Description	Type	Rated Horsepower (hp)	Fuel Consumption (Btu/hp-hr)	Operating Hours (hr/yr)	Pollutant	Emission Factors[a]	Units	Hourly[a] (lb/hr)	Annual[b] (T/yr)
COMP-01	COMP-01	Compressor Engine 1	Caterpillar G3508TALE Lean Burn SCR Catalyst	670	7,656	8,760	CO	3.00	g/hp-hr	4.43	19.40
							NO_X	2.00	g/hp-hr	2.95	12.92
							$PM/PM_{10}/PM_{2.5}$	0.0099871	lb/MMBtu	0.05	0.22
							SO_2	10	ppm S	0.01	0.04
							VOC	1.00	g/hp-hr	1.48	6.48
							CH_2O	0.0528	lb/MMBtu	0.27	1.18
							Benzene[c]	0.004	g/hp-hr	0.01	0.04
COMP-02	COMP-02	Compressor Engine 2	Caterpillar G3508LE Lean Burn	630	7,693	8,760	CO	3.00	g/hp-hr	4.17	18.26
							NO_X	2.00	g/hp-hr	2.78	12.18
							$PM/PM_{10}/PM_{2.5}$	0.0099871	lb/MMBtu	0.05	0.22
							SO_2	10	ppm S	0.01	0.04
							VOC	1.00	g/hp-hr	1.39	6.09
							CH_2O	0.42	g/hp-hr	0.58	2.54
							Benzene[c]	0.004	g/hp-hr	0.006	0.03

[a] The Emission Factors for engine COMP-01 and COMP-02 for CO, NO_X and VOC are based on vendor data and conservatively represented based on the applicable rules. The VOC emission factor is added with the CH_2O emission factor from AP-42 because the vendor provided information does not include formadelhyde. An example calculation for hourly CO emissions for EPN COMP-01 follows:

CO (lb/hr) = (Rated Horsepower, hp)*(Emission Factor, g/hp-hr)*(1 lb/453.59 g)

CO (lb/hr) = (670 hp)*(3.00 g/hp-hr)*(1 lb/453.59 g)

= 4.43 lb/hr CO

The PM/PM_{10} and CH_2O Emission Factors for EPN COMP-01 and COMP-02 are from AP-42 Table 3.2-2 for Four-Stroke Lean Burn Engines (dated 7/00). An example calculation for hourly PM emissions for EPN COMP-01 follows:

PM (lb/hr) = (Fuel Consumption, Btu/hp-hr)*(Rated Horsepower, hp)*(1 MMBtu/10^6 Btu)*(Emission Factor, lb/MMBtu)

PM (lb/hr) = (7,656 Btu/hp-hr)*(670 hp)*(1 MMBtu/10^6 Btu)*(0.0099871 lb/MMBtu)

= 0.05 lb/hr PM

A material balance approach was used to estimate the SO_2 emission rates using the maximum sulfur concentration in the natural gas. H_2S Seavenger liquids are used to bring the fuel gas H_2S concentration below 10 ppm S. An example calculation for hourly SO_2 emissions for EPN COMP-01 follows:

SO_2 (lb/hr) = (Fuel Consumption, Btu/hp-hr)*(Rated Horsepower, hp)/(Lower Fuel Heating Value, Btu/scf)*(Sulfur Content, ppmv)*(1 lb-mol/379 scf)*(32.06 lb S/lb-mol)*(64.06 lb SO_2/32.06 lb S)

SO_2 (lb/hr) = (7,510 Btu/hp-hr)*(670 hp)/(1,335 Btu/scf)*(10 scf S/10^6 scf gas)*(1 lb-mol/379 scf)*(32.06 lb S/lb-mol)*(64.06 lb SO2/32.06 lb S)

= 0.01 lb/hr SO_2

[b] An example calculation for annual CO emissions for EPN COMP-01 follows:

CO (T/yr) = (Hourly PTE, lb/hr)*(Annual Operating Hours, hr/yr)*(1 T/2,000 lb)

CO (T/yr) = (4.43 lb/hr)*(8,760 hr/yr)*(1 T/2,000 lb)

= 19.40 T/yr CO

[c] An example calculation for benzene emission factor (EF) for EPN COMP-01 follows:

Benzene EF (g/hp-hr) = (VOC emission factor, g/hp-hr)*(Benzene AP-42 Emission Factor, lb/MMBtu) / (VOC AP-42 Emission Factor, lb/MMBtu)

Benzene EF (g/hp-hr) = (1.00) * (0.00044 lb/MMBtu) / (0.118 lb/MMBtu)

= 0.004 g/hp-hr

CALCULATION OF SITE FUGITIVES (FIN FUG) POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Component	Number of Components	Emission Factors [a] (lb/hr-component)	Annual Operating Hours (hr/yr)	Maximum VOC[a] (wt%)	Maximum Benzene[a] (wt%)	Maximum H_2S (wt%)	Reduction Credit [a] (%)	PTE VOC Hourly [b] (lb/hr)	PTE VOC Annual [c] (T/yr)	PTE Benzene Hourly [b] (lb/hr)	PTE Benzene Annual [c] (T/yr)	PTE H_2S Hourly [b] (lb/hr)	PTE H_2S Annual [c] (T/yr)
Valves													
Gas Streams	256	0.00992	8,760	30%	0.43%	0.03%	0%	0.76	3.34	0.01	0.05	0.001	0.003
Light Oil	142	0.0055	8,760	100%	0.45%	--	0%	0.78	3.42	0.004	0.02	--	--
Water/Light Oil	108	0.000216	8,760	--	0.20%	--	0%	0.02	0.10	0.00005	0.0002	--	--
Pumps													
Water/Light Oil	10	0.000052	8,760	--	0.20%	--	0%	0.001	0.002	0.000001	0.000005	--	--
Compressors													
Gas Streams	8	0.0194	8,760	30%	0.43%	0.03%	0%	0.05	0.20	0.001	0.003	0.00005	0.0002
Flanges													
Gas Streams	228	0.00086	8,760	30%	0.43%	0.03%	0%	0.06	0.26	0.001	0.004	0.0001	0.0003
Light Oil	58	0.000243	8,760	100%	0.45%	--	0%	0.01	0.06	0.0001	0.0003	--	--
Water/Light Oil	20	0.000006	8,760	--	0.20%	--	0%	0.0001	0.001	0.0000002	0.000001	--	--
Connectors													
Gas Streams	556	0.00044	8,760	30%	0.43%	0.03%	0%	0.07	0.32	0.001	0.005	0.0001	0.0003
Light Oil	408	0.000463	8,760	100%	0.45%	--	0%	0.19	0.83	0.001	0.004	--	--
Water/Light Oil	248	0.000243	8,760	--	0.20%	--	0%	0.06	0.26	0.0001	0.001	--	--
							TOTAL:	**2.00**	**8.79**	**0.02**	**0.09**	**0.001**	**0.004**

[a] Fugitive Emission Factors and Reduction Credits are per TCEQ Technical Guidance Document for Equipment Leak Fugitives, dated October 2000. The emission factors are for total hydrocarbon, except for the emission factors associated with Water/Light Oil. As indicated on page 6 of 55 in the mentioned Guidance document, these factors are based off of a known stream constituency of 50%-99% water, and remainder VOC. Therefore, applying a VOC wt % would be double counting for the reduction due to water.

[b] Hourly VOC emission rates are calculated as follows:
(256 components) * (0.00992 lb/hr-component) * (30% VOC) * (100% - 0% reduction credit) = 0.76 lb/hr

[c] Annual VOC emission rates are calculated as follows:
(256 components) * (0.00992 lb/hr-component) * (8,760 hr/yr) * (30% VOC) * (100% - 0% reduction credit) / (2,000 lb/T) = 3.34 T/yr

CALCULATION OF HEATERS POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	Rated Duty (MMBtu/hr)	Operating Annual (hr/yr)	Pollutant	Emission Factor [a]	Unit	Potential To Emit[b] Hourly (lb/hr)	Potential To Emit[b] Annual (T/yr)
REB-1	REB-1	Glycol Reboiler No. 1	0.50	8,760	CO	84	lb/MMscf	0.04	0.18
					NO_X	100	lb/MMscf	0.05	0.22
					$PM/PM_{10}/PM_{2.5}$ [d]	7.6	lb/MMscf	0.004	0.02
					SO_2 [c]	10.0	ppm H2S	0.001	0.004
					VOC	5.5	lb/MMscf	0.003	0.01
					Benzene	0.002	lb/MMscf	0.000001	0.000004
					CH_2O	0.075	lb/MMscf	0.00004	0.0002

[a] Unless otherwise noted, emission factors are from AP-42 Tables 1.4-1, 1.4-2, and 1.4-3 (dated 7/98) and are based on a fuel HHV of 1020 Btu/scf.

[b] Example calculations for EPN REB-1 follows:

CO (lb/hr) = (Rated Duty, MMBtu/hr)/(Higher Heating Value, Btu/scf)*(Emission Factor, lb/MMscf)

CO (lb/hr) = (0.50 MMBtu/hr)*) / (1020 Btu/scf) * (84 lb/MMscf)

= | 0.04 lb/hr CO |

CO (T/yr) = (Hourly Emissions, lb/hr)*(Annual Operating Hours, hr/yr)/(2,000 lb/T)

CO (T/yr) = (0.04 lb/hr)*(8,760 hr/yr)/(2,000 lb/T)

= | 0.18 T/yr CO |

[c] A material balance approach was used to estimate the SO_2 emission rates using the maximum sulfur concentration in the natural gas. H_2S Scavenger liquids are used to bring the fuel gas H_2S concentration below 10 ppm S.

SO_2 (lb/hr) = (Rated Duty, MMBtu/hr)/(Fuel Heating Value, Btu/scf)*(Sulfure, scf H2S/MMscf gas)*(1 lb-mol/379 scf)*(64.06 lb SO_2/lb-mol S)

SO_2 (lb/hr) = (0.50 MMBtu/hr)/(1020 Btu/scf)*(10.0 scf S/MMscf gas)*(1 lb-mol/379 scf)*(34.065 lb H2S/lb-mol)*(64.06 lb SO2/34.065 lb H2S)

= | 0.001 lb/hr SO_2 |

[d] All PM is assumed to be less than 2.5 microns in diameter per footnote "c" of AP-42 Table 1.4-2.

GLYCOL DEHYDRATOR STILL VENT POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Component	Potential to Emit FIN DEHY-SV/EPN REB-1 Hourly (lb/hr)	Annual (T/yr)
Hydrogen Sulfide	0.0105	0.0462
Methane	0.3647	1.5974
Ethane	0.3684	1.6135
Propane	0.3733	1.6350
Isobutane	0.0689	0.3020
n-Butane	0.1492	0.6533
Isopentane	0.0246	0.1076
n-Pentane	0.0267	0.1167
n-Hexane	0.0064	0.0279
Cyclohexane	0.0142	0.0623
Other Hexanes	0.0131	0.0573
Heptanes	0.0043	0.0190
Benzene	0.0395	0.1732
Toluene	0.0484	0.2121
Ethylbenzene	0.0014	0.0059
Xylenes	0.0091	0.0397
C8+ Heavies	0.0001	0.0001
Total VOC	**0.7792**	**3.4121**

Note: The emissions from the flash tanks are recylced and recompressed. The still vent emissions are controlled by a condenser and then routed to the pilot light of the reboiler.

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Baker Dehy
File Name: T:\ConocoPhillips - 507\507-78 Sugarkane CTB- Baker Dehy Permitting\Calcs\Winsim\bak
Date: February 06, 2013

DESCRIPTION:

Description:

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 120.00 deg. F
Pressure: 1000.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	2.3720
Hydrogen Sulfide	0.0100
Nitrogen	0.2540
Methane	70.6520
Ethane	14.0290
Propane	6.9790
Isobutane	1.0610
n-Butane	2.2350
Isopentane	0.6610
n-Pentane	0.6650
n-Hexane	0.2180
Cyclohexane	0.0880
Other Hexanes	0.4010
Heptanes	0.1930
Benzene	0.0270
Toluene	0.0620
Ethylbenzene	0.0040
Xylenes	0.0230
C8+ Heavies	0.0760

DRY GAS:

Flow Rate: 15.0 MMSCF/day
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.0 wt% H2O
Flow Rate: 4.0 gpm

PUMP:

Glycol Pump Type: Gas Injection
Gas Injection Pump Volume Ratio: 0.080 acfm gas/gpm glycol

FLASH TANK:

Flash Control: Recycle/recompression
Temperature: 250.0 deg. F
Pressure: 125.0 psig

REGENERATOR OVERHEADS CONTROL DEVICE:

Control Device: Condenser
Temperature: 100.0 deg. F
Pressure: 50.0 psia

Control Device: Combustion Device
Destruction Efficiency: 50.0 %
Excess Oxygen: 0.0 %
Ambient Air Temperature: 80.0 deg. F

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Baker Dehy
File Name: T:\ConocoPhillips - 507\507-78 Sugarkane CTB- Baker Dehy Permitting\Calcs\Winsim\b
Date: February 06, 2013

DESCRIPTION:

Description:
Annual Hours of Operation: 8760.0 hours/yr
EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Hydrogen Sulfide	0.0105	0.253	0.0462
Methane	0.3647	8.753	1.5974
Ethane	0.3684	8.841	1.6135
Propane	0.3733	8.959	1.6350
Isobutane	0.0689	1.655	0.3020
n-Butane	0.1492	3.580	0.6533
Isopentane	0.0246	0.590	0.1076
n-Pentane	0.0267	0.640	0.1167
n-Hexane	0.0064	0.153	0.0279
Cyclohexane	0.0142	0.342	0.0623
Other Hexanes	0.0131	0.314	0.0573
Heptanes	0.0043	0.104	0.0190
Benzene	0.0395	0.949	0.1732
Toluene	0.0484	1.162	0.2121
Ethylbenzene	0.0014	0.033	0.0059
Xylenes	0.0091	0.218	0.0397
C8+ Heavies	<0.0001	<0.001	<0.0001
Total Emissions	1.5226	36.544	6.6692
Total Hydrocarbon Emissions	1.5121	36.291	6.6230
Total VOC Emissions	0.7790	18.697	3.4122
Total HAP Emissions	0.1048	2.514	0.4588
Total BTEX Emissions	0.0984	2.361	0.4309

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Hydrogen Sulfide	0.0293	0.703	0.1283
Methane	0.7425	17.819	3.2519
Ethane	0.8077	19.384	3.5376
Propane	1.1301	27.122	4.9497
Isobutane	0.2872	6.892	1.2578
n-Butane	0.7600	18.240	3.3288
Isopentane	0.2581	6.193	1.1303
n-Pentane	0.3177	7.624	1.3913
n-Hexane	0.1934	4.642	0.8471
Cyclohexane	0.5830	13.992	2.5535
Other Hexanes	0.2664	6.394	1.1668
Heptanes	0.3735	8.965	1.6361
Benzene	2.1866	52.478	9.5772
Toluene	7.5377	180.904	33.0150
Ethylbenzene	0.6909	16.582	3.0262
Xylenes	5.5708	133.699	24.4001
C8+ Heavies	0.3498	8.395	1.5321
Total Emissions	22.0845	530.027	96.7299
Total Hydrocarbon Emissions	22.0552	529.324	96.6016
Total VOC Emissions	20.5050	492.121	89.8120
Total HAP Emissions	16.1794	388.305	70.8657
Total BTEX Emissions	15.9860	383.663	70.0186

FLASH GAS EMISSIONS

Note: Flash Gas Emissions are zero with the
Recycle/recompression control option.

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr

Hydrogen Sulfide	0.0867	2.081	0.3797
Methane	51.7223	1241.335	226.5436
Ethane	22.2970	535.127	97.6607
Propane	17.1550	411.720	75.1389
Isobutane	3.6022	86.453	15.7776
n-Butane	8.1855	196.452	35.8525
Isopentane	2.8928	69.428	12.6706
n-Pentane	3.1251	75.002	13.6878
n-Hexane	1.3683	32.840	5.9934
Cyclohexane	1.1528	27.667	5.0492
Other Hexanes	2.3180	55.631	10.1527
Heptanes	1.6958	40.699	7.4276
Benzene	1.0036	24.086	4.3957
Toluene	2.9116	69.879	12.7529
Ethylbenzene	0.1966	4.718	0.8610
Xylenes	1.2057	28.938	5.2811
C8+ Heavies	2.2731	54.553	9.9560
Total Emissions	123.1920	2956.608	539.5810
Total Hydrocarbon Emissions	123.1053	2954.528	539.2013
Total VOC Emissions	49.0861	1178.066	214.9970
Total HAP Emissions	6.6859	160.461	29.2840
Total BTEX Emissions	5.3175	127.620	23.2907

EQUIPMENT REPORTS:

CONDENSER AND COMBUSTION DEVICE

Condenser Outlet Temperature: 100.00 deg. F
Condenser Pressure: 50.00 psia
Condenser Duty: 7.54e-003 MM BTU/hr
Hydrocarbon Recovery: 1.53 bbls/day
Produced Water: 4.03 bbls/day
Ambient Temperature: 80.00 deg. F
Excess Oxygen: 0.00 %
Combustion Efficiency: 50.00 %
Supplemental Fuel Requirement: 7.54e-003 MM BTU/hr

Component	Emitted	Destroyed
Hydrogen Sulfide	35.99%	64.01%
Methane	49.12%	50.88%
Ethane	45.61%	54.39%
Propane	33.03%	66.97%
Isobutane	24.01%	75.99%
n-Butane	19.63%	80.37%
Isopentane	9.52%	90.48%
n-Pentane	8.39%	91.61%
n-Hexane	3.29%	96.71%
Cyclohexane	2.44%	97.56%
Other Hexanes	4.91%	95.09%
Heptanes	1.16%	98.84%
Benzene	1.81%	98.19%
Toluene	0.64%	99.36%
Ethylbenzene	0.20%	99.80%
Xylenes	0.16%	99.84%
C8+ Heavies	0.00%	100.00%

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages: 1.25
Calculated Dry Gas Dew Point: 5.41 lbs. H2O/MMSCF

Temperature: 120.0 deg. F
Pressure: 1000.0 psig
Dry Gas Flow Rate: 15.0000 MMSCF/day
Glycol Losses with Dry Gas: 1.2565 lb/hr

Wet Gas Water Content: Saturated
Calculated Wet Gas Water Content: 102.12 lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio: 3.96 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	5.29%	94.71%
Carbon Dioxide	99.66%	0.34%
Hydrogen Sulfide	98.18%	1.82%
Nitrogen	99.96%	0.04%
Methane	99.97%	0.03%
Ethane	99.92%	0.08%
Propane	99.89%	0.11%
Isobutane	99.87%	0.13%
n-Butane	99.83%	0.17%
Isopentane	99.85%	0.15%
n-Pentane	99.81%	0.19%
n-Hexane	99.74%	0.26%
Cyclohexane	98.83%	1.17%
Other Hexanes	99.79%	0.21%
Heptanes	99.60%	0.40%
Benzene	91.07%	8.93%
Toluene	89.15%	10.85%
Ethylbenzene	87.57%	12.43%
Xylenes	83.41%	16.59%
C8+ Heavies	99.02%	0.98%

FLASH TANK

Flash Control: Recycle/recompression
Flash Temperature: 250.0 deg. F
Flash Pressure: 125.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	97.65%	2.35%
Carbon Dioxide	7.45%	92.55%
Hydrogen Sulfide	25.26%	74.74%
Nitrogen	1.42%	98.58%
Methane	1.42%	98.58%
Ethane	3.50%	96.50%
Propane	6.18%	93.82%
Isobutane	7.38%	92.62%
n-Butane	8.50%	91.50%
Isopentane	8.37%	91.63%
n-Pentane	9.42%	90.58%
n-Hexane	12.61%	87.39%
Cyclohexane	35.35%	64.65%
Other Hexanes	10.72%	89.28%
Heptanes	18.31%	81.69%
Benzene	70.08%	29.92%
Toluene	74.30%	25.70%
Ethylbenzene	80.12%	19.88%
Xylenes	84.48%	15.52%
C8+ Heavies	21.86%	78.14%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	27.67%	72.33%
Carbon Dioxide	0.00%	100.00%
Hydrogen Sulfide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%

Isopentane	2.28%	97.72%
n-Pentane	2.28%	97.72%
n-Hexane	2.02%	97.98%
Cyclohexane	7.51%	92.49%
Other Hexanes	4.24%	95.76%
Heptanes	1.69%	98.31%
Benzene	6.95%	93.05%
Toluene	10.42%	89.58%
Ethylbenzene	12.77%	87.23%
Xylenes	15.11%	84.89%
C8+ Heavies	44.98%	55.02%

STREAM REPORTS:

WET GAS STREAM

Temperature: 120.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 6.27e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.15e-001	6.40e+001
Carbon Dioxide	2.37e+000	1.72e+003
Hydrogen Sulfide	9.98e-003	5.62e+000
Nitrogen	2.53e-001	1.17e+002
Methane	7.05e+001	1.87e+004
Ethane	1.40e+001	6.95e+003
Propane	6.96e+000	5.07e+003
Isobutane	1.06e+000	1.02e+003
n-Butane	2.23e+000	2.14e+003
Isopentane	6.60e-001	7.86e+002
n-Pentane	6.64e-001	7.91e+002
n-Hexane	2.18e-001	3.10e+002
Cyclohexane	8.78e-002	1.22e+002
Other Hexanes	4.00e-001	5.70e+002
Heptanes	1.93e-001	3.19e+002
Benzene	2.69e-002	3.48e+001
Toluene	6.19e-002	9.42e+001
Ethylbenzene	3.99e-003	7.00e+000
Xylenes	2.29e-002	4.02e+001
C8+ Heavies	7.58e-002	2.13e+002
Total Components	100.00	3.91e+004

DRY GAS STREAM

Temperature: 120.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 6.25e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.14e-002	3.38e+000
Carbon Dioxide	2.37e+000	1.71e+003
Hydrogen Sulfide	9.82e-003	5.52e+000
Nitrogen	2.54e-001	1.17e+002
Methane	7.07e+001	1.87e+004
Ethane	1.40e+001	6.95e+003
Propane	6.97e+000	5.07e+003
Isobutane	1.06e+000	1.02e+003
n-Butane	2.23e+000	2.14e+003
Isopentane	6.60e-001	7.85e+002
n-Pentane	6.64e-001	7.89e+002
n-Hexane	2.18e-001	3.09e+002
Cyclohexane	8.70e-002	1.21e+002
Other Hexanes	4.00e-001	5.68e+002
Heptanes	1.92e-001	3.18e+002
Benzene	2.46e-002	3.17e+001
Toluene	5.53e-002	8.39e+001

Ethylbenzene	3.50e-003	6.13e+000
Xylenes	1.92e-002	3.36e+001
C8+ Heavies	7.53e-002	2.11e+002
Total Components	100.00	3.89e+004

LEAN GLYCOL STREAM

Temperature: 120.00 deg. F
Flow Rate: 3.99e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.89e+001	2.22e+003
Water	1.00e+000	2.25e+001
Carbon Dioxide	2.57e-011	5.78e-010
Hydrogen Sulfide	4.54e-013	1.02e-011
Nitrogen	2.01e-013	4.53e-012
Methane	9.03e-018	2.03e-016
Ethane	1.22e-007	2.75e-006
Propane	1.03e-008	2.31e-007
Isobutane	1.82e-009	4.09e-008
n-Butane	4.00e-009	8.99e-008
Isopentane	2.67e-004	6.02e-003
n-Pentane	3.30e-004	7.42e-003
n-Hexane	1.77e-004	3.98e-003
Cyclohexane	2.10e-003	4.73e-002
Other Hexanes	5.25e-004	1.18e-002
Heptanes	2.85e-004	6.42e-003
Benzene	7.26e-003	1.63e-001
Toluene	3.90e-002	8.77e-001
Ethylbenzene	4.50e-003	1.01e-001
Xylenes	4.41e-002	9.92e-001
C8+ Heavies	1.27e-002	2.86e-001
Total Components	100.00	2.25e+003

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 120.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 4.46e+000 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.02e+001	2.22e+003
Water	3.38e+000	8.33e+001
Carbon Dioxide	4.08e-001	1.01e+001
Hydrogen Sulfide	4.71e-003	1.16e-001
Nitrogen	1.37e-002	3.37e-001
Methane	2.13e+000	5.25e+001
Ethane	9.37e-001	2.31e+001
Propane	7.42e-001	1.83e+001
Isobutane	1.58e-001	3.89e+000
n-Butane	3.63e-001	8.94e+000
Isopentane	1.28e-001	3.16e+000
n-Pentane	1.40e-001	3.45e+000
n-Hexane	6.35e-002	1.57e+000
Cyclohexane	7.23e-002	1.78e+000
Other Hexanes	1.05e-001	2.60e+000
Heptanes	8.42e-002	2.08e+000
Benzene	1.36e-001	3.35e+000
Toluene	4.60e-001	1.13e+001
Ethylbenzene	4.01e-002	9.89e-001
Xylenes	3.15e-001	7.77e+000
C8+ Heavies	1.18e-001	2.91e+000
Total Components	100.00	2.46e+003

FLASH TANK OFF GAS STREAM

Temperature: 250.00 deg. F

Pressure: 139.70 psia
Flow Rate: 1.94e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.12e+000	1.96e+000
Carbon Dioxide	4.13e+000	9.31e+000
Hydrogen Sulfide	4.97e-002	8.67e-002
Nitrogen	2.32e-001	3.32e-001
Methane	6.30e+001	5.17e+001
Ethane	1.45e+001	2.23e+001
Propane	7.60e+000	1.72e+001
Isobutane	1.21e+000	3.60e+000
n-Butane	2.75e+000	8.19e+000
Isopentane	7.83e-001	2.89e+000
n-Pentane	8.46e-001	3.13e+000
n-Hexane	3.10e-001	1.37e+000
Cyclohexane	2.68e-001	1.15e+000
Other Hexanes	5.25e-001	2.32e+000
Heptanes	3.31e-001	1.70e+000
Benzene	2.51e-001	1.00e+000
Toluene	6.17e-001	2.91e+000
Ethylbenzene	3.62e-002	1.97e-001
Xylenes	2.22e-001	1.21e+000
C8+ Heavies	2.61e-001	2.27e+000
Total Components	100.00	1.35e+002

FLASH TANK GLYCOL STREAM

Temperature: 250.00 deg. F
Flow Rate: 4.16e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.54e+001	2.22e+003
Water	3.49e+000	8.13e+001
Carbon Dioxide	3.22e-002	7.50e-001
Hydrogen Sulfide	1.26e-003	2.93e-002
Nitrogen	2.05e-004	4.77e-003
Methane	3.19e-002	7.42e-001
Ethane	3.47e-002	8.08e-001
Propane	4.85e-002	1.13e+000
Isobutane	1.23e-002	2.87e-001
n-Butane	3.26e-002	7.60e-001
Isopentane	1.13e-002	2.64e-001
n-Pentane	1.40e-002	3.25e-001
n-Hexane	8.47e-003	1.97e-001
Cyclohexane	2.71e-002	6.30e-001
Other Hexanes	1.19e-002	2.78e-001
Heptanes	1.63e-002	3.80e-001
Benzene	1.01e-001	2.35e+000
Toluene	3.61e-001	8.41e+000
Ethylbenzene	3.40e-002	7.92e-001
Xylenes	2.82e-001	6.56e+000
C8+ Heavies	2.73e-002	6.36e-001
Total Components	100.00	2.33e+003

FLASH GAS EMISSIONS

Control Method: Recycle/recompression
Control Efficiency: 100.00

Note: Flash Gas Emissions are zero with the Recycle/recompression control option.

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 1.36e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)

Water	9.08e+001	5.88e+001
Carbon Dioxide	4.74e-001	7.50e-001
Hydrogen Sulfide	2.39e-002	2.93e-002
Nitrogen	4.73e-003	4.77e-003
Methane	1.29e+000	7.42e-001
Ethane	7.47e-001	8.08e-001
Propane	7.13e-001	1.13e+000
Isobutane	1.37e-001	2.87e-001
n-Butane	3.64e-001	7.60e-001
Isopentane	9.95e-002	2.58e-001
n-Pentane	1.22e-001	3.18e-001
n-Hexane	6.24e-002	1.93e-001
Cyclohexane	1.93e-001	5.83e-001
Other Hexanes	8.60e-002	2.66e-001
Heptanes	1.04e-001	3.74e-001
Benzene	7.78e-001	2.19e+000
Toluene	2.27e+000	7.54e+000
Ethylbenzene	1.81e-001	6.91e-001
Xylenes	1.46e+000	5.57e+000
C8+ Heavies	5.71e-002	3.50e-001
Total Components	100.00	8.17e+001

CONDENSER PRODUCED WATER STREAM

Temperature: 100.00 deg. F
Flow Rate: 1.18e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	9.99e+001	5.88e+001	998800.
Carbon Dioxide	4.86e-002	2.86e-002	486.
Hydrogen Sulfide	4.77e-003	2.81e-003	48.
Nitrogen	7.53e-006	4.43e-006	0.
Methane	2.41e-003	1.42e-003	24.
Ethane	2.89e-003	1.70e-003	29.
Propane	2.51e-003	1.48e-003	25.
Isobutane	2.56e-004	1.50e-004	3.
n-Butane	7.51e-004	4.42e-004	8.
Isopentane	8.88e-005	5.23e-005	1.
n-Pentane	1.05e-004	6.16e-005	1.
n-Hexane	2.13e-005	1.25e-005	0.
Cyclohexane	2.89e-004	1.70e-004	3.
Other Hexanes	3.48e-005	2.05e-005	0.
Heptanes	8.17e-006	4.81e-006	0.
Benzene	2.53e-002	1.49e-002	253.
Toluene	2.61e-002	1.53e-002	261.
Ethylbenzene	5.59e-004	3.29e-004	6.
Xylenes	5.30e-003	3.12e-003	53.
C8+ Heavies	1.03e-008	6.07e-009	0.
Total Components	100.00	5.88e+001	1000000.

CONDENSER RECOVERED OIL STREAM

Temperature: 100.00 deg. F
Flow Rate: 4.48e-002 gpm

Component	Conc. (wt%)	Loading (lb/hr)
Water	6.05e-002	1.15e-002
Carbon Dioxide	2.02e-001	3.86e-002
Hydrogen Sulfide	2.84e-002	5.40e-003
Nitrogen	9.58e-004	1.83e-004
Methane	6.11e-002	1.16e-002
Ethane	3.63e-001	6.92e-002
Propane	2.01e+000	3.82e-001
Isobutane	7.83e-001	1.49e-001
n-Butane	2.42e+000	4.61e-001
Isopentane	1.10e+000	2.09e-001
n-Pentane	1.39e+000	2.64e-001
n-Hexane	9.48e-001	1.81e-001

Cyclohexane 2.91e+000 5.54e-001
Other Hexanes 1.26e+000 2.40e-001
Heptanes 1.92e+000 3.65e-001

Benzene 1.10e+001 2.09e+000
Toluene 3.90e+001 7.43e+000
Ethylbenzene 3.61e+000 6.88e-001
Xylenes 2.91e+001 5.55e+000
C8+ Heavies 1.84e+000 3.50e-001
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Total Components 100.00 1.90e+001

CONDENSER VENT STREAM

Temperature: 100.00 deg. F
Pressure: 50.00 psia
Flow Rate: 4.46e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.94e+000	4.11e-002
Carbon Dioxide	1.32e+001	6.82e-001
Hydrogen Sulfide	5.26e-001	2.11e-002
Nitrogen	1.39e-001	4.58e-003
Methane	3.87e+001	7.29e-001
Ethane	2.08e+001	7.37e-001
Propane	1.44e+001	7.47e-001
Isobutane	2.02e+000	1.38e-001
n-Butane	4.37e+000	2.98e-001
Isopentane	5.79e-001	4.91e-002
n-Pentane	6.29e-001	5.33e-002
n-Hexane	1.26e-001	1.27e-002
Cyclohexane	2.88e-001	2.85e-002
Other Hexanes	2.58e-001	2.62e-002
Heptanes	7.38e-002	8.69e-003
Benzene	8.61e-001	7.91e-002
Toluene	8.94e-001	9.68e-002
Ethylbenzene	2.18e-002	2.72e-003
Xylenes	1.45e-001	1.81e-002
C8+ Heavies	1.05e-004	2.11e-005
Total Components	100.00	3.77e+000

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 1.89e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Hydrogen Sulfide	6.21e-001	1.05e-002
Methane	4.57e+001	3.65e-001
Ethane	2.46e+001	3.68e-001
Propane	1.70e+001	3.73e-001
Isobutane	2.38e+000	6.89e-002
n-Butane	5.15e+000	1.49e-001
Isopentane	6.84e-001	2.46e-002
n-Pentane	7.42e-001	2.67e-002
n-Hexane	1.48e-001	6.37e-003
Cyclohexane	3.40e-001	1.42e-002
Other Hexanes	3.05e-001	1.31e-002
Heptanes	8.71e-002	4.34e-003
Benzene	1.02e+000	3.95e-002
Toluene	1.06e+000	4.84e-002
Ethylbenzene	2.57e-002	1.36e-003
Xylenes	1.72e-001	9.07e-003
C8+ Heavies	1.24e-004	1.05e-005
Total Components	100.00	1.52e+000

SUMMARY OF TANKS SENT TO FLARE POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			VOC Emissions								Benzene Emissions								H_2S Emissions[c]			
			Flash Emissions[a]		WB Emissions[b]		Uncontrolled Total		Controlled Total[d]		Flash Emissions[a]		WB Emissions[b]		Uncontrolled Total		Controlled Total[d]		Uncontrolled Total		Controlled Total[d]	
EPN	FIN	Description	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)
FL-3	TK-19	500 bbl Condensate Storage Tank at Baker	55.81	244.45	17.68	13.15	73.49	257.60	1.47	5.15	0.15	0.66	0.08	0.06	0.23	0.72	0.005	0.01	0.01	0.04	0.0002	0.001
FL-3	TK-20	500 bbl Produced Water Storage Tank at Baker	1.89	8.28	0.08	0.02	1.97	8.30	0.04	0.17	0.01	0.04	0.0004	0.0001	0.01	0.04	0.0002	0.001	0.0004	0.002	0.00001	0.00004
TK-AF[e]	TK-AF[e]	Antifreeze Liquid Storage	--	--	0.50	0.01	0.50	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TK-LO[e]	TK-LO[e]	Lube Oil Liquid Storage	--	--	0.0002	0.000002	0.0002	0.000002	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TK-SCAV[f]	TK-SCAV[f]	H_2S Scavenger Liquid Storage	--	--	--	--	<0.01	<0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[a] VOC Flash Emissions for tanks TK-18 and TK-19 are calculated using the WinSim stream simulation program. Data inputs included the pressurized stream data and throughputs represented in this submittal. See the pages at the end of this attachment for a printout of the data inputs and emissions reports.

[b] The Working/Breathing emissions for tanks TK-18 and TK-19 are calculated using AP 4.2 Chapter 7 calculations with data inputs from the stream data and throughputs. See the following pages for the represented calculations.

[c] The Ideal Gas Law was used to estimate the H2S emission rates using the maximum sulfur concentration in the gas coming off the tanks (100 ppm). An example calculation for hourly H2S emissions from FIN TK-04 follows:

H_2S (lb/hr) = (% Vol H_2S in stream) * (Total Volumetric Flow of Gas, scf/hr) * (1 atm STP) * (34.0798 lb/lb-mol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = (150 ppm /10^6) * (805.81 scf/hr) * (1 atm) * (34.0789 lb/lbmol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = $\boxed{\text{0.01 lb/hr}}$

[d] All VOC tank emissions are routed to the flare control device at Baker with a capture and control efficiency of 98%. H_2S emissions are captured at 98% and then 98% converted to SO_2 during combustion.

[e] Working and breathing emissions for the Antifreeze and Lube Oil tanks were determined using Tanks 4.09d simulation software. The size and number of TK-AF and TK-LO tanks may vary, but the total throughput of the liquid and the associated VOC emissions will not exceed the proposed emission rate. Printouts from the software can be found on the following pages. An example calculation of the hourly emissions for FIN TK-AF follows:

VOC(lb/hr)= ((Breathing Loss, lb/yr) / (8,760 hr/yr)) + ((Working Loss, lb/yr) / (Number of turnovers/yr) / (Turnovers per hour))

VOC(lb/hr)= ((8.909 lb/yr) / (8,760 hr/yr)) + ((5.9832 lb/yr) / (12 turnovers/yr)/ (1 turnover per hour))

= $\boxed{\text{0.50 lb/hr}}$

An example calculation of the annual emissions for FIN TK-AF follows:

VOC(T/yr)= ((Working Loss, lb/yr) + (Breathing Loss, lb/yr)) / (2,000 ton/yr))

VOC(T/yr)= ((5.9832 lb/yr) + (8.909 lb/yr)) / (2,000 ton/yr)

= $\boxed{\text{0.50 T/yr}}$

[f] The size and number of the H_2S Scavenger Liquid Storage Tanks may vary, but the total throughput of the liquid and the associated VOC emissions will not exceed the proposed negligible emission rate.

NOTE: The tanks found at the Sugarkane CTB site (TK-01 through TK-19) are controlled by a VRU with 100% control efficiency (per TCEQ Standard Permit guidance) and therefore are not represented in the emsisions shown here for normal operations. During VRU downtime, however, emissions from the tanks are sent to the flaring device for a 98% control efficiency. This is represented on the subsequent pages as an SMSS event.

CALCULATION OF STORAGE TANK WORKING AND BREATHING POTENTIAL TO EMIT
OIL & GAS STANDARD PERMIT REGISTRATION
SUGARKANE CTB - BAKER DEIIY UNIT
BURLINGTON RESOURCES OIL & GAS COMPANY LP

Variable	Description	Units	Value
L_T	total loss = Ls + Lw	Ton/yr	See Table
L_S	standing loss = 385 Vv Wv Ke Ks	lb/yr	See Table
L_W	working loss = 0.001 Mv Pv Q Kn Kp	lb/yr	See Table
L_H	working loss = 0.001 Mv Pmax Qh	lb/hr	See Table
	Roof Construction		Cone
RVP	Condensate Reid Vapor Pressure	psia	11.05
ΔPb	Breather vent pressure range	psi	0.06
I	Solar insolation factor	Btu/ft2-day	1521
P_A	Atmospheric Pressure	psia	14.7
Mv	Vapor Molecular Weight	lb/lb-mol	40
T	Annual Average Temperature	°F	72.1
T_{AX}	Daily Maximum Ambient Temperature	°R	541.6
T_{AN}	Daily Minimum Ambient Temperature	°R	522.5
ΔT_A	Daily average ambient temperature range	°R	19.1
Kp	Product factor		1

		Tank Specifications							Material Specifications			
		V/H	D	H/L	Capacity	Color		α	Mv	P_{MAX}	Q	
Tank Identifier	No. of Tanks	Tank Type	Tank Diameter (ft)	Tank Height/ Length (ft)	Tank Capacity (bbl)	Paint Color	Paint Conditions	Paint Solar Absorbance Factor	Vapor Molecular Weight	Reid Vapor Pressure (psia)	Max. Hourly Thruput (bbl/hr)	Annual thruput (bbl)
Condensate (Baker)	1	V	12	25	500	Gray	Good	0.54	40	11.05	40	182,500
PW (Baker)	1	V	12	25	500	Gray	Good	0.54	35	9.111	20	73,000

													VOC		Benzene	
	ΔTv	Hvo	Vv	T_{LA}	P_{VA}	Wv	ΔPv	Ke	Ks	Kn	L_S	L_W	L_T	L_H	L_T	L_H
Tank Identifier	Daily Vapor Temp. Range °F	Vapor Space Outage (ft)	Vapor Space Volume (ft3)	Daily Average Liquid Surface Temp °R	Average Vapor Pressure (psia)	Vapor Density (lb/ft3)	Daily Vapor Pressure Range	Vapor Space Expan. Factor	Vented Vapor Sat. Factor	Turnover Factor	Standing Loss per tank (lb/yr)	Working Loss per tank (lb/yr)	Total Loss (lb/hr)	Total Loss (T/yr)	Total Loss (lb/hr)	Total Loss (T/yr)
Condensate (Baker)	36.75	12.63	1428.4	539.8	11.649	0.08044	3.18790	1.0933	0.11	0.25	5,043.74	21,259.43	17.68	13.15	0.08	0.06
PW (Baker)	36.75	12.63	1428.4	539.8	0.032	0.00019	0.02005	0.0662	0.98	0.37	6.43	30.25	0.08	0.02	0.0004	0.0001

NOTE: Tank working and breathing emissions are based on the equations found in EPA AP 42 Chapter 7. All factors used are represented in the table on this page. The Condensate Reid Vapor Pressure and Vapor Moleculsr Weight are determined based on the WinSim condensate stream and Off Gas stream. All other variables are found in AP 42 Chapter 7 or are default unit values.

CALCULATION OF TRUCK LOADING POTENTIAL TO EMIT
OIL & GAS STANDARD PERMIT REGISTRATION
SUGARKANE CTB - BAKER DEHY UNIT
BURLINGTON RESOURCES OIL & GAS COMPANY LP

Sample Calculations for condensate and slop:

Loading Loss (lb/Mgal) = 12.46 * S * P * M / T (AP-42 Section 5.2)
Maximum Loading Loss = 12.46 * 0.60 * 11.050 * 40 / 560 = 5.901 lb/Mgal

Hourly Uncollected Emissions PTE = (Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (1 - Capture Efficiency)
Hourly Uncollected Emissions PTE = (8.19 Mgal/hr) * (5.901 lb/Mgal) * (1 - 0.987) = 0.63 lb/hr

Hourly PTE = ((Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Control Efficiency)) + (Hourly Uncollected Loading Emissions, (lb/hr))
Hourly PTE = (8.19 Mgal/hr) * (5.901 lb/Mgal) * (0.987) * (1 - 1.00) + (0.63 lb/hr) = 0.63 lb/hr

Annual Emissions = ((Annual Throughput, Mgal/yr) * (Average Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Control Efficiency)) + (Annual Uncollected Loading Emissions, lb/yr)) / (2000 lb/T)
Annual Emissions = (12516.00 Mgal/yr) * (5.747 lb/Mgal) * (0.987) * (1 - 1.00) + (935.08 lb/yr) / (2000 lb/T) = 0.47 T/yr

FIN	EPN	Facility Name	S	P @ 560 °R (psia)	P @531.7 °R (psia)	M	Maximum Loading Loss (lb/Mgal)	Average Loading Loss (lb/Mgal)	Hourly Throughput (Mgal/hr)	Annual Throughput (Mgals/yr)	Capture Efficiency	Hourly Uncollected Loading Emissions (lb/hr)	Annual Uncollected Loading Emissions (lb/yr))	Control Efficiency	VOC Hourly PTE (lb/hr)	VOC Annual PTE (T/yr)	Benzene Hourly PTE (lb/hr)	Benzene Annual PTE (T/yr)
TRUCK1	VRU	Condensate and Slop Tank Truck Loading (Sugarkane)	0.60	11.05	10.218	40	5.901	5.747	8.19	12,516.00	0.987	0.63	935.08	1.00	0.63	0.47	0.003	0.002
TRUCK2	VRU	Produced Water Tank Truck Loading (Sugarkane)	0.60	0.11	0.023	35	0.051	0.054	8.19	6,132.00	0.987	0.01	4.30	1.00	0.01	0.002	0.00005	0.00001
TRUCK3	FL-3	Condensate Tank Truck Loading (Baker)	0.60	11.05	10.218	40	5.901	5.747	8.19	7,665.00	0.987	0.63	572.66	0.98	1.58	0.72	0.01	0.003
TRUCK4	FL-3	Produced Water Tank Truck Loading (Baker)	0.60	0.11	0.023	35	0.051	0.054	8.19	3,066.00	0.987	0.01	2.15	0.98	0.02	0.003	0.0001	0.00001

Daily maximum and daily minimum ambient temperature from Tanks 4.09d for this area's annual averages (81.03 and 62.05, for average of 71.5

Annual Average Condensate Vapor Pressure at T_{LA}:
P = exp{ [(2799/(T+459.6) - 2.227]log10(RVP) - 7261/(T+459.6) + 12.82}
exp{ [(2799/(71.54+459.6) - 2.227]log10(11.05) - 7261/(71.54+459.6) + 12.82}
10.218 psia

Annual Average Produced Water Vapor Pressure at T_{LA}:
P = exp{ [(2799/(T+459.6) - 2.227]log10(RVP) - 7261/(T+459.6) + 12.82}
exp{ [(2799/(71.54+459.6) - 2.227]log10(11.05*.01) - 7261/(71.54+459.6) + 12.82}
0.023 psia

NOTE: During normal operations the VRU controls 100% of VOC emissions from loading in Sugarkane CTB, FINs TRUCK1 and TRUCK2 (per TCEQ Standard Permit VRU guidance). Loading at Baker Dehy Unit (FINs TRUCK3 AND TRUCK4) will be captured, routed to Flare 3, and controlled at 98% capture and combustion efficiency. Capture Efficiency of 98.7% represented based upon TCEQ Guidance regarding trucks that are utlizing NSPS XX Testing.

SUMMARY OF PROCESS FLARE FUEL GAS COMBUSTION AND WASTE GAS COMBUSTION POTENTIAL TO EMIT- NORMAL OPERATIONS

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			CO		NO_X		SO_2		H_2S		VOC		Benzene	
EPN	FIN	Description	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)
FL-1	FL-1	Pilot Gas Combustion	0.01	0.04	0.003	0.01	0.0004	0.002	0.0000001	0.0000004	0.0001	0.0004	0.00000003	0.0000001
FL-1	FL-1	Flare Assist Gas Combustion	0.44	1.93	0.22	0.96	0.03	0.13	0.00001	0.00004	0.01	0.04	0.000003	0.00001
		Flare 1 Totals:	**0.45**	**1.97**	**0.22**	**0.97**	**0.03**	**0.13**	**0.00001**	**0.00004**	**0.01**	**0.04**	**0.000003**	**0.00001**
FL-2	FL-2	Pilot Gas Combustion	0.01	0.04	0.003	0.01	0.0004	0.002	0.0000001	0.0000004	0.0001	0.0004	0.00000003	0.0000001
FL-2	FL-2	Flare Assist Gas Combustion	0.44	1.93	0.22	0.96	0.03	0.13	0.00001	0.00004	0.01	0.04	0.000003	0.00001
		Flare 2 Totals:	**0.45**	**1.97**	**0.22**	**0.97**	**0.03**	**0.13**	**0.00001**	**0.00004**	**0.01**	**0.04**	**0.000003**	**0.00001**
FL-3	FL-3	Pilot Gas Combustion	0.01	0.04	0.003	0.01	0.0004	0.002	0.0000001	0.0000004	0.0001	0.0004	0.00000003	0.0000001
FL-3	FL-3	Flare Assist Gas Combustion	0.44	1.93	0.22	0.96	0.03	0.13	0.00001	0.00004	0.01	0.04	0.000003	0.00001
FL-3	FL-3	Waste Gas Combustion	1.17	2.73	0.59	1.37	0.01	0.02	0.0001	0.0002	--	--	--	--
		Flare 3 Totals:	**1.62**	**4.70**	**0.81**	**2.34**	**0.04**	**0.15**	**0.0001**	**0.0002**	**0.01**	**0.04**	**0.000003**	**0.00001**

NOTE: Pilot Gas Combustion and Flare Assist Gas Combustion calculations are shown on the following page. Waste Gas Combustion shown here is the combined sum of the waste gas from the Condensate and Produced Water tanks and loading operations shown on subsequent pages.

CALCULATION OF FLARES PILOT GAS AND FLARE ASSIST GAS POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV (Btu/scf)	Heat Release scf/hr	Operating Hours (hr/yr)	Pollutant	Emission Factors	Units	Emission Rates Hourly[a] (lb/hr)	Emission Rates Annual[b] (T/yr)
FL-1	FL-1	Flare 1- Process Pilot Gas Combustion	1,292	15	8,760	CO	0.2755	lb/MMBtu	0.01	0.04
						NO_X	0.138	lb/MMBtu	0.003	0.01
						$PM/PM_{10}/PM_{2.5}$	--[c]	--	--	--
						SO_2	150	ppm H_2S	0.0004	0.002
						H_2S	150	ppm H_2S	0.0000001	0.0000004
						VOC	5.5	lb/MMscf	0.0001	0.0004
						Benzene	0.0021	lb/MMscf	0.00000003	0.0000001
FL-1	FL-1	Flare 1- Process Flare Assist Gas Combustion	1,292	1,250	8,760	CO	0.2755	lb/MMBtu	0.44	1.93
						NO_X	0.138	lb/MMBtu	0.22	0.96
						$PM/PM_{10}/PM_{2.5}$	--[c]	--	--	--
						SO_2	150	ppm H_2S	0.03	0.13
						H_2S	150	ppm H_2S	0.00001	0.00004
						VOC	5.5	lb/MMscf	0.01	0.04
						Benzene	0.0021	lb/MMscf	0.000003	0.00001
FL-2	FL-2	Flare 2- Process Pilot Gas Combustion	1,292	15	8,760	CO	0.2755	lb/MMBtu	0.01	0.04
						NO_X	0.138	lb/MMBtu	0.003	0.01
						$PM/PM_{10}/PM_{2.5}$	--[c]	--	--	--
						SO_2	150	ppm H_2S	0.0004	0.002
						H_2S	150	ppm H_2S	0.0000001	0.0000004
						VOC	5.5	lb/MMscf	0.0001	0.0004
						Benzene	0.0021	lb/MMscf	0.00000003	0.0000001
FL-2	FL-2	Flare 2- Process Flare Assist Gas Combustion	1,292	1,250	8,760	CO	0.2755	lb/MMBtu	0.44	1.93
						NO_X	0.138	lb/MMBtu	0.22	0.96
						$PM/PM_{10}/PM_{2.5}$	--[c]	--	--	--
						SO_2	150	ppm H_2S	0.03	0.13
						H_2S	150	ppm H_2S	0.00001	0.00004
						VOC	5.5	lb/MMscf	0.01	0.04
						Benzene	0.0021	lb/MMscf	0.000003	0.00001

CALCULATION OF FLARES PILOT GAS AND FLARE ASSIST GAS POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV (Btu/scf)	Heat Release scf/hr	Operating Hours (hr/yr)	Pollutant	Emission Factors	Units	Emission Rates Hourly [a] (lb/hr)	Emission Rates Annual [b] (T/yr)
FL-3	FL-3	Flare 2- Process Pilot Gas Combustion	1,292	15	8,760	CO	0.2755	lb/MMBtu	0.01	0.04
						NO_X	0.138	lb/MMBtu	0.003	0.01
						$PM/PM_{10}/PM_{2.5}$	-- [c]	--	--	--
						SO_2	150	ppm H_2S	0.0004	0.002
						H_2S	150	ppm H_2S	0.0000001	0.0000004
						VOC	5.5	lb/MMscf	0.0001	0.0004
						Benzene	0.0021	lb/MMscf	0.00000003	0.0000001
FL-3	FL-3	Flare 2- Process Flare Assist Gas Combustion	1,292	1,250	8,760	CO	0.2755	lb/MMBtu	0.44	1.93
						NO_X	0.138	lb/MMBtu	0.22	0.96
						$PM/PM_{10}/PM_{2.5}$	-- [c]	--	--	--
						SO_2	150	ppm H_2S	0.03	0.13
						H_2S	150	ppm H_2S	0.00001	0.00004
						VOC	5.5	lb/MMscf	0.01	0.04
						Benzene	0.0021	lb/MMscf	0.000003	0.00001

[a] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions for EPNs FL-1 and FL-2 follows:

CO (lb/hr) = (Heat Release, scf/hr) * (Lower Heating Value, Btu/scf) * (MM/10^6)*(Emission Factor, lb/MMBtu)
CO (lb/hr) = (15 scf/hr) * (1,292 Btu/scf) * (MM/10^6)*(0.2755 lb/MMBtu)
= | 0.01 lb/hr CO |

The Emission Factors for VOC and Benzene were based upon AP-42 Table 1.4-2 and 1.4-3 (dated 7/98). An example calculation for hourly VOC emissions for EPNs FL-1 and FL-02 follows:

VOC (lb/hr) = (Heat Release, scf/hr) * (MM/10^6) * (Emission Factor, lb/MMscf)
VOC (lb/hr) = (15 scf/hr) * (MM/10^6) * (5.5 lb/MMscf)
= | 0.0001 lb/hr VOC |

A material balance approach was used to estimate the SO2 and H2S emission rates using the maximum sulfur concentration in the natural gas. As shown in Figure 6-1, H2S concentration at the site is conservatively represented at 150 ppm. When used as a pilot gas or flare assist gas, 98% of this concentration will be converted to SO2, and 2% will remain uncombusted and unconverted. An example calculation for hourly SO2 emissions for the pilot gas of EPNs FL-01 and FL-02 follows:

SO_2 (lb/hr) = Heat Release (scf/hr)*(Sulfur Content, ppmv)*(98% conversion to SO_2)*(1 lb-mol/379 scf)*(34.065 lb H2S/lb-mol)*(64.06 lb SO_2/34.065 lb H2S)

SO_2 (lb/hr) = (15 scf/hr)*((150 ppm H2S)/(10^6 scf gas))*(98% converted to SO2)*(1 lb-mol/379 scf)*(34.065 lb H2S/lb-mol)*(64.06 lb SO2/34.065 lb H2S)

= | 0.000 lb/hr SO_2 |

[b] An example calculation for annual CO emissions for EPNs FL-1 and FL-02 follows:

CO (T/yr) = (Hourly Emissions, lb/hr)*(Annual Operating Hours, hr/yr)*(1 T/2,000 lb)
CO (T/yr) = (0.01 lb/hr)*(8,760 hr/yr)*(1 T/2,000 lb)
CO (T/yr) = | 0.04 T/yr CO |

[c] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

PROCESS FLARE 3 (BAKER) WASTE GAS COMBUSTION EMISSIONS- NORMAL OPERATIONS

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV[a] (Btu/scf)	Waste Gas Flow Rate Hourly (MMBtu/hr)	Waste Gas Flow Rate Annual (MMBtu/yr)	Pollutant	Emission Factors	Units	Potential to Emit Hourly[b] (lb/hr)	Potential to Emit Annual[c] (T/yr)
FL-3	FL-3	Process Flare	2,088	4.17	19,238.78	CO	0.2755	lb/MMBtu	1.15	2.65
		Baker Condensate Tank and Loading				NO_X	0.1380	lb/MMBtu	0.58	1.33
						$PM/PM_{10}/PM_{2.5}$	--[e]	--	--	--
						SO_2	--[c]	--	0.01	0.02
						H_2S	--[c]	--	0.0001	0.0002
FL-3	FL-3	Process Flare	1,779	0.08	575.14	CO	0.2755	lb/MMBtu	0.02	0.08
		Baker Produced Water Tank and Loading				NO_X	0.1380	lb/MMBtu	0.01	0.04
						$PM/PM_{10}/PM_{2.5}$	--[e]	--	--	--
						SO_2	0.6	lb/MMscf	0.0004	0.002
						H_2S	--[c]	--	0.000004	0.00002

[a] Waste gas stream lower heating value was taken from WinSim calculated stream value.

[b] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for non-assisted high-Btu flares. An example calculation for hourly CO emissions for EPN Fl-1 follows:

CO (lb/hr) = (Hourly Waste Gas Flow Rate, MMBtu/hr)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (4.17 MMBtu/hr)*(0.2755 lb/MMBtu)

= $\boxed{1.15 \quad \text{lb/hr CO}}$

[c] H_2S emissions are routed from the tanks to the flare and from the seperator to the flare and then converted to SO_2. SO_2 emission rates were determined based on the combustion efficiency of 98% H_2S converted to SO_2. H_2S emitted at the flare is 2% of the stream not converted by combustion. An example calculation for hourly SO_2 emissions for EPN FL-1 follows:

SO_2 (lb/hr) = (Source H_2S Emission Rate, lb/hr) * (98% captured H2S stream) * (98% conversion to SO_2 at combustion) * (1 mol H_2S/34.07 lb H_2S) * (64.06 lb SO2/1 mol SO_2)

SO_2 (lb/hr) = (0.005 lb/hr H2S at Condensate Tanks)* (98%) * (98%) * (1 mol H2S/34.07 lb H2S) * (64.06 lb SO2/1 mol SO2)

= $\boxed{0.01 \quad \text{lb/hr } SO_2}$

[d] An example calculation for annual CO emissions for EPN FL-1 follows:

CO (T/yr) = (Annual Waste Gas Flow Rate, MMBtu/yr) * (Emission Factor, lb/MMBtu) * (1 T / 2,000 lb)

CO (T/yr) = (19,238.78 MMBtu/yr) * (0.2755 lb/MMBtu) * (1 T / 2,000 lb)

= $\boxed{2.65 \quad \text{T/yr CO}}$

[e] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

SMSS - CALCULATION OF COMPRESSOR ENGINE STARTER VENT POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Description	Facility Identification Number COMP-01-SV	Facility Identification Number COMP-02-SV
Number of Engine Starts per Year	52	52
Number of Engine Starts per Hour	1	1
Start Volume per Event, scf	900	900
Fuel Stream Specific Gravity	0.8185	0.8185
Fuel Stream Density, lb/scf [a]	0.0625	0.0625
VOC Percentage in Fuel Stream, wt%	30%	30%
Max Benzene Percentage in Gas Stream, wt%	0.13%	0.13%
Max H_2S Percentage in Fuel Stream, wt%	0.03%	0.03%
VOC Hourly Emission Rates (lb/hr): [b]	16.88	16.88
VOC Annual Emission Rates (T/yr): [c]	0.44	0.44
Benzene Hourly Emission Rates (lb/hr): [b]	0.07	0.07
Benzene Annual Emission Rates (T/yr): [c]	0.002	0.002
H_2S Hourly Emission Rates (lb/hr): [b]	0.02	0.02
H_2S Annual Emission Rates (T/yr): [c]	0.0004	0.0004

[a] Gas stream density is calculated as follows:

(28.96 lb/mole) / (379 scf/mole) * (0.8185) = 0.0625 lb/scf

[b] Hourly starter vent VOC, benzene and H2S emissions are calculated based upon a conservative estimate of the portion of each consituent in the volume known to blow down from the engine source. An example calculation for VOC for COMP-01-SV is as follows:

VOC lb/hr = (1 startup/hr) * (900 scf/startup) * (0.063 lb/scf) * (30.00%) = 16.88 lb/hr

[c] Annual starter VOC emission rates for COMP-01-SV is calculated as follow:

VOC lb/hr = (52 startups/yr) * (900 scf/startup) * (0.063 lb/scf) * (30.00%) / (2,000 lb/T) = 0.44 T/yr

SMSS - CALCULATION OF COMPRESSOR ENGINE BLOWDOWN POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Description	Facility Identification Number COMP-01-BD	Facility Identification Number COMP-02-BD
Number of Blowdowns per Year	52	52
Number of Blowdowns per Hour	1	1
Blowdown Volume per Event, scf	687	646
Gas Stream Specific Gravity	0.8185	0.8185
Gas Stream Density, lb/scf [a]	0.0625	0.0625
Max VOC Percentage in Gas Stream, wt%	30%	30%
Max Benzene Percentage in Gas Stream, wt%	0.13%	0.13%
Max H_2S Percentage in Gas Stream, wt%	0.03%	0.03%
VOC Hourly Emission Rates (lb/hr): [b]	12.88	12.11
VOC Annual Emission Rates (T/yr): [c]	0.33	0.31
Benzene Hourly Emission Rates (lb/hr): [b]	0.06	0.05
Benzene Annual Emission Rates (T/yr): [c]	0.001	0.001
H_2S Hourly Emission Rates (lb/hr): [b]	0.01	0.01
H_2S Annual Emission Rates (T/yr): [c]	0.0003	0.0003
Controlled VOC Hourly Emission Rates (lb/hr) [d]	0.26	0.24
Controlled VOC Annual Emission Rates (T/yr): [e]	0.01	0.01
Controlled Benzene Hourly Emission Rates (lb/hr): [d]	0.001	0.001
Controlled Benzene Annual Emission Rates (T/yr): [e]	0.00002	0.00002
Controlled H_2S Hourly Emission Rates (lb/hr) [d]	0.0002	0.0002
Controlled H_2S Annual Emission Rates (T/yr): [e]	0.00001	0.00001

[a] Gas stream density is calculated as follows:

(28.96 lb/mole) / (379 scf/mole) * (0.8185) = 0.0625 lb/scf

[b] Hourly blowdown VOC, Benzene and H_2S emissions rates are calculated. An example calculation for VOC for COMP-01-BD is as follows:

VOC lb/hr = (1 blowdown/hr) * (687 scf/blowdown) * (0.063 lb/scf) * (30.00% VOC in Stream) * (100-98% controlled at flare) = 12.88 lb/hr

[c] Annual blowdown VOC, Benzene and H_2S emission rates are calculated as follows:

VOC lb/hr = (52 blowdowns/yr) * (687 scf/blowdown) * (0.063 lb/scf) * (30.00%) / (2,000 lb/T) * (100% - 98% controlled at flare) = 0.33 T/yr

[d] Hourly controlled blowdown VOC, Benzene and H_2S emissions are calculated based upon a conservative estimate of the portion of each consituent in the volume known to blowdown from the engine source. An example calculation for VOC for COMP-01-BD is as follows:

VOC lb/hr = (1 blowdown/hr)*(687 scf/blowdown)*(0 lb/scf)*(30% VOC in Stream)*(100-98% controlled at flare) = 0.26lb/hr

[e] Annual controlled blowdown VOC emission rates are calculated as follows:

VOC T/yr = (1 blowdown/hr)*(687 scf/blowdown)*(0 lb/scf)*(30% VOC in Stream)*(100-98% controlled at flare) / (2,000 lb/T) = 0.01 T/yr

SMSS - SUMMARY OF TANKS SENT TO FLARE DURING VRU DOWNTIME POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			VOC Emissions								Benzene Emissions								H_2S Emissions[c]			
			Flash Emissions[a]		WB Emissions[b]		Uncontrolled Total		Controlled Total[d]		Flash Emissions[a]		WB Emissions[b]		Uncontrolled Total		Controlled Total[d]		Uncontrolled Total		Controlled Total[d]	
EPN	FIN	Description	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)
FL-2-SMSS	TK-01 through TK-08	500 bbl Condensate Storage Tanks	89.23	31.23	17.68	23.74	106.91	54.97	2.14	1.10	0.25	0.09	0.08	0.11	0.33	0.20	0.01	0.004	0.02	0.01	0.0004	0.0002
FL-2-SMSS	TK-09	500 bbl Slop Storage Tank	--	--	8.84	2.54	8.84	2.54	0.18	0.05	--	--	0.04	0.01	0.04	0.01	0.001	0.0002	--	--	--	--
FL-2-SMSS	TK-10 through TK-18	500 bbl Produced Water Storage Tanks	3.78	1.32	0.08	0.04	3.86	1.36	0.08	0.03	0.01	0.004	0.0002	0.0001	0.01	0.004	0.0002	0.0001	0.001	0.0004	0.00002	0.00001

Notes:

[a] VOC and Benzene Flash Emissions are calculated using the WinSim stream simulation program. Data inputs included the pressurized stream data and throughputs represented in this submittal. See the pages at the end of this attachment for a printout of the data inputs and emissions reports.

[b] The Working/Breathing emissions for tanks TK-01 thourgh TK-05 are calculated using AP 42 Chapter 7 calculations with data inputs from the stream data and throughputs. See the following pages for the represented calculations.

[c] The Ideal Gas Law was used to estimate the H2S emission rates using the maximum sulfur concentration in the gas coming off the tanks 150 ppm. An example calculation for hourly H2S emissions from FIN TK-09 follows:

H_2S (lb/hr) = (% Vol H_2S in stream) * (Total Volumetric Flow of Gas, scf/hr) * (1 atm STP) * (34.0798 lb/lb-mol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = (150 ppm/10^6) * (68.76 scf/hr) * (1 atm) * (34.0789 lb/lbmol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = $\boxed{0.001 \text{ lb/hr}}$

[d] During normal operations, tank emissions are routed to the VRU control device which has a 100% control efficiency, per design and TCEQ Standard Permit control guidance. During VRU Downtime, the flare control device is used to contain emissions with a capture and control efficiency of 98%. H_2S emissions are captured at 98% and then 98% converted to SO_2 during combustion. The emissions shown are due to VRU downtime which is conservatively estimated to occur 8% of the year.

SMSS - CALCULATION OF STORAGE TANK WORKING AND BREATHING POTENTIAL TO EMIT

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Variable	Description	Units	Value
L_T	total loss = Ls + Lw	Ton/yr	See Table
L_S	standing loss = 365 Vv Wv Ke Ks	lb/yr	See Table
L_W	working loss = 0.001 Mv Pv Q Kn Kp	lb/yr	See Table
L_H	working loss = 0.001 Mv Pmax Qh	lb/hr	See Table
	Roof Construction		Cone
RVP	Condensate Reid Vapor Pressure	psia	11.05
ΔPb	Breather vent pressure range	psi	0.06
i	Solar insolation factor	Btu/ft2-day	1521
P_A	Atmospheric Pressure	psia	14.7
Mv	Vapor Molecular Weight	lb/lb-mol	40
T	Annual Average Temperature	°F	71.54
T_{AX}	Daily Maximum Ambient Temperature	°R	541.03
T_{AN}	Daily Minimum Ambient Temperature	°R	522.05
ΔT_A	Daily average ambient temperature range	°R	19.0
Kp	Product factor		1

		Tank Specifications							Material Specifications			
		V/H	D	H/L	Capacity	Color		α	Mv	P_{MAX}	Q[2]	
Material	No. of Tanks	Tank Type	Tank Diameter (ft)	Tank Height/ Length (ft)	Tank Capacity (bbl)	Paint Color	Paint Conditions	Paint Solar Absorbance Factor	Vapor Molecular Weight	Reid Vapor Pressure (psia)	Max. Hourly Thruput (bbl/hr)	Annual thruput (bbl)
Condensate	8	V	12	25	500	Gray	Good	0.54	40	11.05	40	23200
Slop	1	V	12	25	500	Gray	Good	0.54	40	11.05	20	500
PW	9	V	12	25	500	Gray	Good	0.54	35	0.111	20	11600

													VOC		Benzene	
	ΔTv	Hvo	Vv	T_{LA}	P_{VA}	Wv	ΔPv	Ke	Ks	Kn	L_S	L_W	L_T	L_H	L_T	L_H
Material	Daily Vapor Temp. Range °F	Vapor Space Outage (ft)	Vapor Space Volume (ft3)	Daily Average Liquid Surface Temp °R	Average Vapor Pressure (psia)	Vapor Density (lb/ft3)	Daily Vapor Pressure Range	Vapor Space Expan. Factor	Vented Vapor Sat. Factor	Turnover Factor	Standing Loss per tank (lb/yr)	Working Loss per tank (lb/yr)	Total Loss (lb/hr)	Total Loss (T/yr)	Total Loss (lb/hr)	Total Loss (T/yr)
Condensate	36.68	12.63	1428.4	539.3	11.563	0.07992	3.16419	1.0576	0.11	0.81	38,780.03	8,691.68	17.68	23.74	0.08	0.11
Slop	36.68	12.63	1428.4	539.3	11.563	0.07992	3.16419	1.0576	0.11	1.00	4,847.50	231.26	8.84	2.54	0.04	0.01
PW	36.68	12.63	1428.4	539.3	0.031	0.00019	0.01942	0.0660	0.98	1.00	57.87	12.59	0.08	0.04	0.0002	0.0001

NOTE: Tank working and breathing emissions are based on the equations found in EPA AP 42 Chapter 7. All factors used are represented in the table on this page. The Condensate Reid Vapor Pressure and Vapor Molecular Weight are determined based on the WinSim condensate stream and off Gas stream. All other variables are found in AP 42 Chapter 7 or are default unit values.

The emissions shown are due to VRU downtime. During normal operations the VRU controls 100% of VOC emissions from the Sugarkane CTB tanks (per TCEQ Standard Permit VRU guidance). When the VRU is down, emissions are routed to flare2. VRU downtime is conservatively estimated to occur 8% of the year- which encompasses both downtime due to compressor maintenance (which effects the VRU) as well as downtime due to VRU maintenance. The calculations shown demonstrate this. Based on 8% downtime, this scenario is being shown to occur for 700 hours in a year.

SMSS - CALCULATION OF TRUCK LOADING AT SUGARKANE POTENTIAL TO EMIT
OIL & GAS STANDARD PERMIT REGISTRATION
SUGARKANE CTB - BAKER DEHY UNIT
BURLINGTON RESOURCES OIL & GAS COMPANY LP

Sample Calculations for condensate and slop:

Loading Loss (lb/Mgal) = 12.46 * S * P * M / T (AP-42 Section 5.2)
Maximum Loading Loss = 12.46 * 0.60 * 11.050 * 40 / 560 = 5.901 lb/Mgal

Hourly Uncollected Emissions PTE = (Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (1 - Capture Efficiency)
Hourly Uncollected Emissions PTE = (8.19 Mgal/yr) * (5.901 lb/Mgal) * (1 - 0.987) = 0.63 lb/hr

Hourly PTE = ((Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Control Efficiency)) + (Hourly Uncollected Loading Emissions, (lb/hr))
Hourly PTE = (8.19 Mgal/hr) * (5.901 lb/Mgal) * (0.987) * (1 - 0.98) + (0.63 lb/hr) = 1.58 lb/hr

Annual Emissions = ((Annual Throughput, Mgal/yr) * (Average Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Control Efficiency)) + (Annual Uncollected Loading Emissions, lb/yr)) / (2000 lb/T)
Annual Emissions = (995.40 Mgal/yr) * (5.747 lb/Mgal) * (0.987) * (1 - 0.98) + (74.37 lb/yr) / (2000 lb/T) = 0.09 T/yr

EPN	FIN	Facility Name	S	P @ 560 °R (psia)	P @531.7 °R (psia)	M	Maximum Loading Loss (lb/Mgal)	Average Loading Loss (lb/Mgal)	Hourly Throughput (Mgal/hr)	Annual Throughput (Mgals/yr)	Capture Efficiency	Hourly Uncollected Loading Emissions (lb/hr)	Annual Uncollected Loading Emissions (lb/yr))	FL-2 Control Efficiency	VOC Hourly PTE (lb/hr)	VOC Annual PTE (T/yr)	Benzene Hourly PTE (lb/hr)	Benzene Annual PTE (T/yr)
FL-2-SMSS	TRUCK1	Condensate and Slop Tank Truck Loading	0.60	11.05	10.218	40	5.901	5.747	8.19	995.40	0.987	0.63	74.37	0.98	1.58	0.09	0.01	0.0004
FL-2-SMSS	TRUCK2	Produced Water Tank Truck Loading	0.60	0.11	0.023	35	0.051	0.054	8.19	487.20	0.987	0.01	0.34	0.98	0.02	0.0004	0.0001	0.000002

Daily maximum and daily minimum ambient temperature from Tanks 4.09d for this area's annual averages (81.03 and 62.05, for average of 71.54).

Annual Average Condensate Vapor Pressure at T_{LA}:
P = exp{ [(2799/(T+459.6) - 2.227]log10(RVP) - 7261/(T+459.6) + 12.82}
exp{ [(2799/(71.54+459.6) - 2.227]log10(11.05) - 7261/(71.54+459.6) + 12.82}
10.218 psia

Annual Average Produced Water Vapor Pressure at T_{LA}:
P = exp{ [(2799/(T+459.6) - 2.227]log10(RVP) - 7261/(T+459.6) + 12.82}
exp{ [(2799/(71.54+459.6) - 2.227]log10(11.05*.01) - 7261/(71.54+459.6) + 12.82}
0.023 psia

NOTE: The emissions shown are due to VRU downtime. During normal operations the VRU controls 100% of VOC emissions from loading (per TCEQ Standard Permit VRU guidance). When the VRU is down, emissions are routed to flare 2. VRU downtime is conservatively estimated to occur 8% of the year- which encompasses both downtime due to compressor maintenance (which effects the VRU) as well as downtime due to VRU maintenance. The calculations shown demonstrate this alternative operating scenario. Based on 8% downtime, this scenario is being shown to occur for 700 hours in a year. Capture Efficiency of 98.7% represented based upon TCEQ Guidance regarding trucks that are utilizing NSPS XX Testing.

SMSS - SUMMARY OF PROCESS FLARES FUEL GAS COMBUSTION AND WASTE GAS COMBUSTION POTENTIAL TO EMIT- NORMAL OPERATIONS

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	CO		NO_X		SO_2		H_2S	
			(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)
FL-1-SMSS	COMP-01-BD COMP-02-BD	Flare Combustion (engine blowdown waste gas)	0.48	0.01	0.24	0.01	0.04	0.001	0.0004	0.00001
		FL-1-SMSS	**0.48**	**0.01**	**0.24**	**0.01**	**0.04**	**0.001**	**0.0004**	**0.00001**
FL-2-SMSS	FL-2-SMSS	Waste Gas Combustion (during VRU downtime)	1.59	0.58	0.80	0.30	0.04	0.02	0.0004	0.0002
		FL-2-SMSS	**1.59**	**0.58**	**0.80**	**0.30**	**0.04**	**0.02**	**0.0004**	**0.0002**

NOTE: Pilot Gas Combustion and Flare Assist Gas Combustion calculations are shown on the following page. Waste Gas Combustion shown here is the combined sum of the waste gas from the Condensate and Produced Water tanks and loading operations shown on subsequent pages.

SMSS - PROCESS FLARE 1 WASTE GAS COMBUSTION EMISSIONS FROM ENGINE BLOWDOWN

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV[a] (Btu/scf)	Waste Gas Flow Rate Hourly (MMBtu/hr)	Waste Gas Flow Rate Annual (MMBtu/yr)	Pollutant	Emission Factors	Units	Potential to Emit Hourly[b] (lb/hr)	Potential to Emit Annual[d] (T/yr)
FL-1-SMSS	COMP-01-BD	Process Flare	1,335	1.75	92.52	CO	0.2755	lb/MMBtu	0.48	0.01
	COMP-02-BD	Blowdowns Gas to Flare 1 Event				NO_X	0.1380	lb/MMBtu	0.24	0.01
						$PM/PM_{10}/PM_{2.5}$	--[e]	--	--	--
						SO_2	--[c]	--	0.04	0.001
						H_2S	--[e]	--	0.0004	0.00001

[a] Waste gas stream lower heating value was taken from the inlet gas analysis.

[b] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions for EPN Fl-1-SMSS follows:

CO (lb/hr) = (Hourly Waste Gas Flow Rate, MMBtu/hr)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (1.75 MMBtu/hr)*(0.2755 lb/MMBtu)

= | 0.48 lb/hr CO |

[c] H_2S emissions are routed from the separator and engine blowdown to flare 1 and then converted to SO_2. SO_2 emission rates were determined based on the combustion efficiency of 98% H_2S converted to SO_2. H_2S emitted at the flare is 2% of the captured stream not converted by combustion. An example calculation for hourly SO_2 emissions for EPN Fl-1-SMSS follows:

SO_2 (lb/hr) = (Source H_2S Emission Rate, lb/hr) * (98% captured H2S stream) * (98% conversion to SO_2 at combustion) * (1 mol H_2S/34.07 lb H_2S) * (64.06 lb SO2/1 mol SO_2)

SO_2 (lb/hr) = (1.00 lb/hr H2S Engine BD)* (98%) * (98%) * (1 mol H2S/34.07 lb H2S) * (64.06 lb SO2/1 mol SO2)

= | 0.04 lb/hr SO_2 |

[d] An example calculation for annual CO emissions for EPN FL-1 follows:

CO (T/yr) = (Annual Waste Gas Flow Rate, MMBtu/yr) * (Emission Factor, lb/MMBtu) * (1 T / 2,000 lb)

CO (T/yr) = (0,092.52 MMBtu/yr) * (0.2755 lb/MMBtu) * (1 T / 2,000 lb)

= | 0.01 T/yr CO |

[e] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

SMSS - CALCULATION OF FLARE 1 FEED RATES FROM ENGINES BLOWDOWN

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Max Engines BD Volume (Mscf/hr)	1.33
Max Engines BD Volume (Mscf/yr)	69.32
Gas Density (lb/scf)	0.0625

			Engine BD Emissions[b] COMP-01-BD and COMP-02-BD		**Flare Feed Rate[c]**	
Constituent	**Heating Value[a] (Btu/lb)**	**Inlet Gas Weight (%)**	**Hourly (lb/hr)**	**Annual (T/yr)**	**Hourly (MMBtu/hr)**	**Annual (MMBtu/yr)**
Methane	23,861	47.98%	39.88	1.04	0.93	48.64
Ethane	22,304	17.86%	14.85	0.39	0.32	17.05
Propane	21,646	13.03%	10.83	0.28	0.23	11.88
I-Butane	21,242	2.61%	2.17	0.06	0.05	2.50
N-Butane	21,293	5.50%	4.57	0.12	0.10	5.01
I-Pentane	21,025	2.02%	1.68	0.04	0.03	1.65
N-Pentane	21,072	2.03%	1.69	0.04	0.03	1.65
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	0.80%	0.67	0.02	0.01	0.82
Cyclohexane	20,195	0.32%	0.27	0.01	0.01	0.40
Other Hexanes	20,928	1.46%	1.21	0.03	0.02	1.23
Heptanes	20,825	0.82%	0.68	0.02	0.01	0.82
Octanes	20,747	0.21%	0.17	0.005	0.003	0.20
Nonanes	20,687	0.14%	0.12	0.003	0.002	0.12
Decanes Plus	20,638	0.04%	0.03	0.001	0.001	0.04
Benzene	18,172	0.09%	0.07	0.002	0.001	0.07
Toluene	18,422	0.24%	0.20	0.01	0.004	0.36
Ethylbenzene	18,658	0.02%	0.02	0.0004	0.0004	0.01
Xylene	18,438	0.10%	0.08	0.002	0.001	0.07
				Totals:	**1.75**	**92.52**

[a] Heating values taken from Perry's Chemical Engineers' Handbook, Table 3-207 (pg. 3-155)

[b] Constituent Emission Rates were calculated from the known maximum blowdown volumes and density then proportioned using the Inlet Gas stream constituents weight percents. An example calculation for Methane emissions is as follows:

Methane (lb/hr) = Maximum BD Volume (Mscf/hr) * Gas Density (lb/scf) * Inlet Gas Weight % * 1000
Methane (lb/hr) = (1.33 Mscf/hr) * (0.0625 lb/scf) * 47.98% * 1,000
Methane (lb/hr) = 39.88 lb/hr

[c] An example calculation for the hourly flare feed rate for Methane is demonstrated.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 98% of stream is combusted / 10^6
MMBtu/hr Methane = (23,861 Btu/lb) * (0,039.88 lb/hr) * 98% / (10^6)
MMBtu/hr Methane = 0.93 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 98% of stream is combusted / 10^6
MMBtu/yr Methane = (23,861 Btu/lb) * (1.04 T/yr) * (2,000 lb/T) * 98% / (10^6)
MMBtu/yr Methane = 48.64 MMBtu/yr

SMSS - PROCESS FLARE 2 WASTE GAS COMBUSTION EMISSIONS

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV[a] (Btu/scf)	Waste Gas Flow Rate Hourly (MMBtu/hr)	Waste Gas Flow Rate Annual (MMBtu/yr)	Pollutant	Emission Factors	Units	Potential to Emit Hourly[b] (lb/hr)	Potential to Emit Annual[d] (T/yr)
FL-2-SMSS	FL-2-SMSS	Process Flare	2,088	5.63	4,144.06	CO	0.2755	lb/MMBtu	1.55	0.57
		Condensate and Slop Tanks during VRU downtime				NO_X	0.1380	lb/MMBtu	0.78	0.29
						$PM/PM_{10}/PM_{2.5}$	--[c]	--	--	--
						SO_2	--[c]	--	0.04	0.02
						H_2S	--[c]	--	0.0004	0.0002
FL-2-SMSS	FL-2-SMSS	Process Flare	1,779	0.16	93.91	CO	0.2755	lb/MMBtu	0.04	0.01
		Produced Water Tank during VRU downtime				NO_X	0.1380	lb/MMBtu	0.02	0.01
						$PM/PM_{10}/PM_{2.5}$	--[c]	--	--	--
						SO_2	--[c]	--	0.002	0.001
						H_2S	--[c]	--	0.00002	0.00001

[a] Waste gas stream lower heating value was taken from WinSim calculated stream value.

[b] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions for EPN Fl-2-SMSS follows:

CO (lb/hr) = (Hourly Waste Gas Flow Rate, MMBtu/hr)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (5.63 MMBtu/hr)*(0.2755 lb/MMBtu)

= $\boxed{1.55 \quad \text{lb/hr CO}}$

[c] H_2S emissions are routed from the tanks to the flare to flare 2 during VRU downtime and then converted to SO_2. SO_2 emission rates were determined based on the combustion efficiency of 98% H_2S converted to SO_2. H_2S emitted at the flare is 2% of the stream not converted by combustion. An example calculation for hourly SO_2 emissions for EPN FL-2-SMSS follows:

SO_2 (lb/hr) = (Source H_2S Emission Rate, lb/hr) * (98% captured H2S stream) * (98% conversion to SO_2 at combustion) * (1 mol H_2S/34.07 lb H_2S) * (64.06 lb SO2/1 mol SO_2)

SO_2 (lb/hr) = (0.02 lb/hr H2S at Condensate Tanks)* (98%) * (98%) * (1 mol H2S/34.07 lb H2S) * (64.06 lb SO2/1 mol SO2)

= $\boxed{0.04 \quad \text{lb/hr } SO_2}$

[d] An example calculation for annual CO emissions for EPN FL-2-SMSS follows:

CO (T/yr) = (Annual Waste Gas Flow Rate, MMBtu/yr) * (Emission Factor, lb/MMBtu) * (1 T / 2,000 lb)

CO (T/yr) = (4,144.06 MMBtu/yr) * (0.2755 lb/MMBtu) * (1 T / 2,000 lb)

= $\boxed{0.57 \quad \text{T/yr CO}}$

[e] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

SMSS - CALCULATION OF FLARE 2 FEED RATES FROM FINs TK-01 THROUGH TK-09 AND TRUCK1

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TK-01 through TK-09 and TRUCK1 Total Emissions:[a]

VOC Emissions (lb/hr):	163.25
VOC Emissions (TPY):	60.15
Hydrocarbon Emissions (lb/hr):	269.17
Hydrocarbon Emissions (TPY):	99.18

Constituent	Heating Value[b] (Btu/lb)	Condensate Tanks Flash Gas Weight (%)	TK-01 through TK-09 and TRUCK1 Emissions[c] Hourly (lb/hr)	Annual (T/yr)	Flare Feed Rate[d] Hourly (MMBtu/hr)	Annual (MMBtu/yr)
Methane	23,861	15.93%	42.88	15.80	1.00	738.93
Ethane	22,304	20.53%	55.26	20.36	1.21	890.05
Propane	21,646	25.62%	68.96	25.41	1.46	1,078.05
I-Butane	21,242	5.66%	15.24	5.61	0.32	233.57
N-Butane	21,293	13.74%	36.98	13.63	0.77	568.84
I-Pentane	21,025	4.48%	12.06	4.44	0.25	182.97
N-Pentane	21,072	4.84%	13.03	4.80	0.27	198.25
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	3.35%	9.02	3.32	0.18	136.18
Cyclohexane	20,195	0.37%	1.00	0.37	0.02	14.65
Other Hexanes	20,928	0.00%	0.00	0.00	0.00	0.00
Heptanes	20,825	1.25%	3.36	1.24	0.07	50.61
Octanes	20,747	0.38%	1.02	0.38	0.02	15.45
Nonanes	20,687	0.12%	0.32	0.12	0.01	4.87
Decanes Plus	20,638	0.32%	0.86	0.32	0.02	12.94
Benzene	18,172	0.17%	0.46	0.17	0.01	6.05
Toluene	18,422	0.22%	0.59	0.22	0.01	7.94
Ethylbenzene	18,658	0.02%	0.05	0.02	0.001	0.73
Xylene	18,438	0.11%	0.30	0.11	0.01	3.98
	VOC	60.65%				
				Total:	5.63	4,144.06

[a] Total VOC Emissions were determined by adding the Uncontrolled Streams for FIN TK-01 through TK-09 on the SMSS Tank Summary table with the uncontrolled emissions from the Condensate and Slop Truck SMSS Loading (FIN TRUCK1). Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)

Total HC (lb/hr) = (163.25 lb/hr) * (1 / 60.65%)

Total HC (lb/hr) = 269.17 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Condensate Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 98% of stream is combusted / 10^6

MMBtu/hr Methane = (23,861 Btu/lb) * (42.88 lb/hr) * 98% / (10^6)

MMBtu/hr Methane = 1.00 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 98% of stream is combusted / 10^6

MMBtu/yr Methane = (23,861 Btu/lb) * (15.80 T/yr) * (2,000 lb/T) * 98% / (10^6)

MMBtu/yr Methane = 738.93 MMBtu/yr

SMSS - CALCULATION OF FLARE 2 FEED RATES FROM FINs TK-10 THROUGH TK-19 AND TRUCK2

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TK-10 through TK-19 and TRUCK2 Total Emissions:[a]

VOC Emissions (lb/hr):	4.36
VOC Emissions (TPY):	1.37
Hydrocarbon Emissions (lb/hr):	7.16
Hydrocarbon Emissions (TPY):	2.25

Constituent	Heating Value[b] (Btu/lb)	Produced Water Tanks Flash Gas Weight (%)	TK-10 through TK-19 and TRUCK2 Emissions[c] Hourly (lb/hr)	TK-10 through TK-19 and TRUCK2 Emissions[c] Annual (T/yr)	Flare Feed Rate[d] Hourly (MMBtu/hr)	Flare Feed Rate[d] Annual (MMBtu/yr)
Methane	23,861	15.69%	1.12	0.35	0.03	16.37
Ethane	22,304	20.31%	1.45	0.46	0.03	20.11
Propane	21,646	25.51%	1.83	0.57	0.04	24.18
I-Butane	21,242	5.72%	0.41	0.13	0.01	5.41
N-Butane	21,293	13.87%	0.99	0.31	0.02	12.94
I-Pentane	21,025	4.52%	0.32	0.10	0.01	4.12
N-Pentane	21,072	4.89%	0.35	0.11	0.01	4.54
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	3.38%	0.24	0.08	0.00	3.28
Cyclohexane	20,195	0.37%	0.03	0.01	0.001	0.40
Other Hexanes	20,928	0.00%	0.00	0.00	0.00	0.00
Heptanes	20,825	1.27%	0.09	0.03	0.002	1.22
Octanes	20,747	0.38%	0.03	0.01	0.001	0.41
Nonanes	20,687	0.12%	0.01	0.003	0.0002	0.12
Decanes Plus	20,638	0.33%	0.02	0.01	0.000	0.40
Benzene	18,172	0.17%	0.01	0.004	0.0002	0.14
Toluene	18,422	0.22%	0.02	0.005	0.0004	0.18
Ethylbenzene	18,658	0.02%	0.001	0.0005	0.00002	0.02
Xylene	18,438	0.11%	0.01	0.002	0.0002	0.07
	VOC	60.88%				
				Total:	0.16	93.91

[a] Total VOC Emissions were determined by adding the Uncontrolled Streams for FINs TK-10 through TK-19 on the SMSS Tank Summary table and the uncontrolled emissions associated with the produced water SMSS loading, FIN TRUCK2. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)

Total HC (lb/hr) = (04.36 lb/hr) * (1/ 60.88%)

Total HC (lb/hr) = 7.16 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook, Table 3-207 (pg. 3-155)

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Produced Water Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 98% of stream is combusted / 10^6

MMBtu/hr Methane = (23,861 Btu/lb) * (1.12 lb/hr) * 98% / (10^6)

MMBtu/hr Methane = 0.03 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 98% of stream is combusted / 10^6

MMBtu/yr Methane = (23,861 Btu/lb) * (0.35 T/yr) * (2,000 lb/T) * 98% / (10^6)

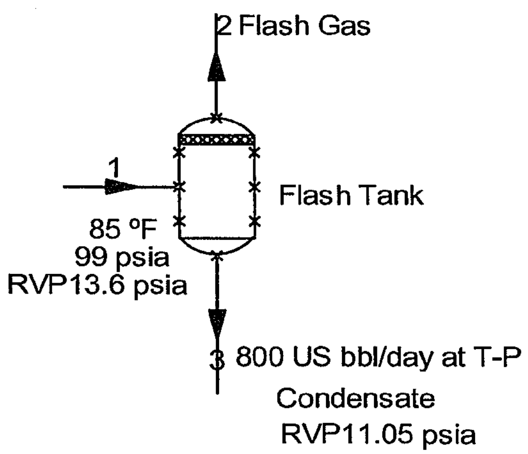
MMBtu/yr Methane = 16.37 MMBtu/yr

DESIGN II for Windows

SUGARKANE CTB - CONDENSATE

Simulation Result: SOLUTION RE

Problem:
Project:
Task:
By:
At: 19-Apr-12 11:44 AM



Details for Stream 1

Stream 1 (Strm 1)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:
	Liquid 2 Visc:	STEAM	Liquid 2 ThC:	STEAM	Liquid 2 Den:

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %
46 : NITROGEN	0.036305	0	0.036305	0	0.048001
49 : CARBON DIOXIDE	0.094544	0	0.094544	0	0.125003
2 : METHANE	1.5891	0	1.5891	0	2.10104
3 : ETHANE	1.57397	0	1.57397	0	2.08104
4 : PROPANE	2.73724	0	2.73724	0	3.61907
5 : ISOBUTANE	0.953006	0	0.953006	0	1.26003
6 : N-BUTANE	3.01936	0	3.01936	0	3.99208
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	2.10191	0	2.10191	0	2.77906
8 : N-PENTANE	2.89683	0	2.89683	0	3.83008
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	5.55693	0	5.55693	0	7.34715
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.322207	0	0.322207	0	0.426009
38 : CYCLOHEXANE	0.813837	0	0.813837	0	1.07602
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	5.8867	0	5.8867	0	7.78316
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	1.37959	0	1.37959	0	1.82404
12 : N-OCTANE	5.00555	0	5.00555	0	6.61813
45 : ETHYL BENZENE	0.335065	0	0.335065	0	0.443009
43 : M-XYLENE	1.99224	0	1.99224	0	2.63405
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	4.51316	0	4.51316	0	5.96712
14 : N-DECANE	34.8263	0	34.8263	0	46.0459
62 : WATER	0	0	0	0	0
Total	75.6339	0	75.6339	0	100

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	1.01703	0	1.01703	0	0.012061
49 : CARBON DIOXIDE	4.16078	0	4.16078	0	0.049344
2 : METHANE	25.4939	0	25.4939	0	0.302338
3 : ETHANE	47.3262	0	47.3262	0	0.561253
4 : PROPANE	120.696	0	120.696	0	1.43136
5 : ISOBUTANE	55.3887	0	55.3887	0	0.656868
6 : N-BUTANE	175.485	0	175.485	0	2.08113
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	151.644	0	151.644	0	1.79839
8 : N-PENTANE	208.995	0	208.995	0	2.47852
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	478.852	0	478.852	0	5.67882
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	25.1669	0	25.1669	0	0.298461
38 : CYCLOHEXANE	68.4892	0	68.4892	0	0.812231

79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	589.836	0	589.836	0	6.99501
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	127.107	0	127.107	0	1.50739
12 : N-OCTANE	571.754	0	571.754	0	6.78057
45 : ETHYL BENZENE	35.5705	0	35.5705	0	0.421839
43 : M-XYLENE	211.496	0	211.496	0	2.50818
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	578.813	0	578.813	0	6.86429
14 : N-DECANE	4954.95	0	4954.95	0	58.7619
62 : WATER	0	0	0	0	0
Total	8432.24	0	8432.24	0	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.093521	0	0.093521	0	0.048001
49 : CARBON DIOXIDE	0.243545	0	0.243545	0	0.125003
2 : METHANE	4.0935	0	4.0935	0	2.10104
3 : ETHANE	4.05453	0	4.05453	0	2.08104
4 : PROPANE	7.0511	0	7.0511	0	3.61907
5 : ISOBUTANE	2.45493	0	2.45493	0	1.26003
6 : N-BUTANE	7.77784	0	7.77784	0	3.99208
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	5.41448	0	5.41448	0	2.77906
8 : N-PENTANE	7.46221	0	7.46221	0	3.83008
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	14.3146	0	14.3146	0	7.34715
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.83	0	0.83	0	0.426009
38 : CYCLOHEXANE	2.09643	0	2.09643	0	1.07602
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	15.1641	0	15.1641	0	7.78316
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	3.5538	0	3.5538	0	1.82404
12 : N-OCTANE	12.8942	0	12.8942	0	6.61813
45 : ETHYL BENZENE	0.863122	0	0.863122	0	0.443009
43 : M-XYLENE	5.13197	0	5.13197	0	2.63405
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	11.6258	0	11.6258	0	5.96712
14 : N-DECANE	89.7121	0	89.7121	0	46.0459
62 : WATER	0	0	0	0	0
Total	194.832	0	194.832	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.02021	0	0.02021	0	0.010574
49 : CARBON DIOXIDE	0.081161	0	0.081161	0	0.042464
2 : METHANE	1.36322	0	1.36322	0	0.713241
3 : ETHANE	2.12913	0	2.12913	0	1.11397
4 : PROPANE	3.81431	0	3.81431	0	1.99567
5 : ISOBUTANE	1.5777	0	1.5777	0	0.825461
6 : N-BUTANE	4.81773	0	4.81773	0	2.52066
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	3.89303	0	3.89303	0	2.03685
8 : N-PENTANE	5.30998	0	5.30998	0	2.77821
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0

52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	11.5633	0	11.5633	0	6.04995
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.456227	0	0.456227	0	0.2387
38 : CYCLOHEXANE	1.4017	0	1.4017	0	0.733378
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	13.7431	0	13.7431	0	7.19044
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	2.33776	0	2.33776	0	1.22313
12 : N-OCTANE	12.968	0	12.968	0	6.78493
45 : ETHYL BENZENE	0.654316	0	0.654316	0	0.342341
43 : M-XYLENE	3.9035	0	3.9035	0	2.04233
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	12.8574	0	12.8574	0	6.72705
14 : N-DECANE	108.238	0	108.238	0	56.6307
62 : WATER	0	0	0	0	0
Total	191.13	0	191.13	0	100

Properties

Temperature	F	85	
Pressure	psia	98.696	
Enthalpy	Btu/hr	-1106599	
Entropy	Btu/hr/R	-1194.035	
Vapor Fraction		0	
		Total	Liquid 1
Flowrate	lbmol/hr	75.6339	75.6339
Flowrate	lb/hr	8432.2384	8432.2384
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		111.4876	111.4876
Enthalpy	Btu/lbmol	-14631.0071	-14631.0071
Enthalpy	Btu/lb	-131.2344	-131.2344
Entropy	Btu/lbmol/R	-15.787	-15.787
Entropy	Btu/lb/R	-0.141604	-0.141604
Cp	Btu/lbmol/R		56.3698
Cp	Btu/lb/R		0.5056
Cv	Btu/lbmol/R		49.3271
Cv	Btu/lb/R		0.4424
Cp/Cv			1.1428
Density	lb/ft3		43.2796
Z-Factor			0.043502
Flowrate (T-P)	gal/min		24.2923
Flowrate (STP)	gal/min		23.8292
Specific Gravity	GPA STP		0.707396
Viscosity	cP		0.495811
Thermal Conductivity	Btu/hr/ft/R		0.068329
Surface Tension	dyne/cm		19.1391
Reid Vapor Pressure (ASTM-A	psia		13.6
True Vapor Pressure at 100 F	psia		95.25
Critical Temperature (Cubic E	F	593.0848	
Critical Pressure (Cubic EOS)	psia	479.1639	
Dew Point Temperature	F	452.1604	
Bubble Point Temperature	F	107.7105	
Water Dew Point Temperature could not be calculated			
Stream Vapor Pressure	psia	88.6915	
Latent Heat of Vaporization (N	Btu/lb	103.1429	
Latent Heat of Vaporization (P	Btu/lb	324.9526	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	6065.23	
Heating Value (net)	Btu/SCF	5632.2	
Wobbe Number	Btu/SCF	2923.77	
Average Hydrogen Atoms		17.2137	
Average Carbon Atoms		7.8337	
Hydrogen to Carbon Ratio		2.1974	

Details for Stream 2

Stream 2 (Flash Gas)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Vapor Visc:	NBS81	Vapor ThC:	NBS81	Vapor Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Incipient Liquid 1 mol fra	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.035128	0.035128	0.00001649	0	0.834113	505.969
49 : CARBON DIOXIDE	0.074136	0.074136	0.000286	0	1.76039	61.6097
2 : METHANE	1.46127	1.46127	0.00179	0	34.6984	193.878
3 : ETHANE	1.00473	1.00473	0.00797	0	23.8577	29.9343
4 : PROPANE	0.85484	0.85484	0.026356	0	20.2984	7.70166
5 : ISOBUTANE	0.143335	0.143335	0.011336	0	3.40352	3.0023
6 : N-BUTANE	0.347842	0.347842	0.037404	0	8.25959	2.20818
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	1.48838
7 : ISOPENTANE	0.091319	0.091319	0.028151	0	2.1684	0.770284
8 : N-PENTANE	0.098742	0.098742	0.039177	0	2.34465	0.598482
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.360909
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.263381
52 : 2-METHYLPENTANE	0	0	0	0	0	0.236664
53 : 3-METHYLPENTANE	0	0	0	0	0	0.210746
10 : N-HEXANE	0.057183	0.057183	0.077003	0	1.35784	0.176335
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.154099
40 : BENZENE	0.003141	0.003141	0.004467	0	0.074591	0.166971
38 : CYCLOHEXANE	0.006386	0.006386	0.011305	0	0.151648	0.134139
79 : 2-METHYLHEXANE	0	0	0	0	0	0.065693
80 : 3-METHYLHEXANE	0	0	0	0	0	0.066054
11 : N-HEPTANE	0.018411	0.018411	0.082163	0	0.437172	0.053208
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.051298
41 : TOLUENE	0.003458	0.003458	0.019267	0	0.082116	0.042619
12 : N-OCTANE	0.004842	0.004842	0.070016	0	0.114983	0.016422
45 : ETHYL BENZENE	0.000316	0.000316	0.004687	0	0.007493	0.015986
43 : M-XYLENE	0.001569	0.001569	0.027872	0	0.037259	0.013368
42 : O-XYLENE	0	0	0	0	0	0.007514
13 : N-NONANE	0.001382	0.001382	0.06317	0	0.032827	0.005197
14 : N-DECANE	0.003326	0.003326	0.487563	0	0.078988	0.00162
62 : WATER	0	0	0	0	0	0.024719
Total	4.21137	4.21137	1	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Incipient Liquid 1 mass fra	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.984042	0.984042	0.000004	0	0.668823
49 : CARBON DIOXIDE	3.26266	3.26266	0.000108	0	2.21753
2 : METHANE	23.4432	23.4432	0.000248	0	15.9336
3 : ETHANE	30.2103	30.2103	0.002066	0	20.533
4 : PROPANE	37.6933	37.6933	0.01002	0	25.619
5 : ISOBUTANE	8.33061	8.33061	0.00568	0	5.66206
6 : N-BUTANE	20.2166	20.2166	0.01874	0	13.7406
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	6.58831	6.58831	0.01751	0	4.47787
8 : N-PENTANE	7.12383	7.12383	0.02437	0	4.84185
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	4.92761	4.92761	0.0572	0	3.34914
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.24536	0.24536	0.003008	0	0.166763
38 : CYCLOHEXANE	0.537458	0.537458	0.008202	0	0.365294

79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	1.84473	1.84473	0.07097	0	1.25381
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.318617	0.318617	0.0153	0	0.216554
12 : N-OCTANE	0.553113	0.553113	0.06894	0	0.375934
45 : ETHYL BENZENE	0.033498	0.033498	0.004289	0	0.022767
43 : M-XYLENE	0.166577	0.166577	0.02551	0	0.113217
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.1773	0.1773	0.06984	0	0.120505
14 : N-DECANE	0.473275	0.473275	0.598	0	0.32167
62 : WATER	0	0	0	0	0
Total VOC:		89.230188			
Total	147.13	147.13	1	0	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	13.4592	13.4592	0	0	0.834113
49 : CARBON DIOXIDE	28.4055	28.4055	0	0	1.76039
2 : METHANE	559.89	559.89	0	0	34.6984
3 : ETHANE	384.965	384.965	0	0	23.8577
4 : PROPANE	327.534	327.534	0	0	20.2984
5 : ISOBUTANE	54.9189	54.9189	0	0	3.40352
6 : N-BUTANE	133.276	133.276	0	0	8.25959
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	34.9891	34.9891	0	0	2.1684
8 : N-PENTANE	37.8331	37.8331	0	0	2.34465
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	21.9099	21.9099	0	0	1.35784
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	1.20359	1.20359	0	0	0.074591
38 : CYCLOHEXANE	2.44698	2.44698	0	0	0.151648
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	7.05416	7.05416	0	0	0.437172
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	1.32501	1.32501	0	0	0.082116
12 : N-OCTANE	1.85536	1.85536	0	0	0.114983
45 : ETHYL BENZENE	0.1209	0.1209	0	0	0.007493
43 : M-XYLENE	0.601208	0.601208	0	0	0.037259
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.52969	0.52969	0	0	0.032827
14 : N-DECANE	1.27454	1.27454	0	0	0.078988
62 : WATER	0	0	0	0	0
Total	1613.59	1613.59	0	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	13.3303	13.3303	0	0	0.834113
49 : CARBON DIOXIDE	28.1335	28.1335	0	0	1.76039
2 : METHANE	554.529	554.529	0	0	34.6984
3 : ETHANE	381.279	381.279	0	0	23.8577
4 : PROPANE	324.398	324.398	0	0	20.2984
5 : ISOBUTANE	54.3931	54.3931	0	0	3.40352
6 : N-BUTANE	132	132	0	0	8.25959
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	34.6541	34.6541	0	0	2.1684
8 : N-PENTANE	37.4709	37.4709	0	0	2.34465
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0

55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	21.7001	21.7001	0	0	1.35784
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	1.19207	1.19207	0	0	0.074591
38 : CYCLOHEXANE	2.42355	2.42355	0	0	0.151648
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	6.98663	6.98663	0	0	0.437172
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	1.31233	1.31233	0	0	0.082116
12 : N-OCTANE	1.83759	1.83759	0	0	0.114983
45 : ETHYL BENZENE	0.119742	0.119742	0	0	0.007493
43 : M-XYLENE	0.595452	0.595452	0	0	0.037259
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.524619	0.524619	0	0	0.032827
14 : N-DECANE	1.26233	1.26233	0	0	0.078988
62 : WATER	0	0	0	0	0
Total	1598.14	1598.14	0	0	100

Properties

Temperature	F	70	
Pressure	psia	14.7	
Enthalpy	Btu/hr	2139.764	
Entropy	Btu/hr/R	18.99568	
Vapor Fraction		1	
		Total	Vapor
Flowrate	lbmol/hr	4.2114	4.2114
Flowrate	lb/hr	147.1304	147.1304
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		34.9365	34.9365
Enthalpy	Btu/lbmol	508.0927	508.0927
Enthalpy	Btu/lb	14.5433	14.5433
Entropy	Btu/lbmol/R	4.5106	4.5106
Entropy	Btu/lb/R	0.129108	0.129108
Cp	Btu/lbmol/R		14.5903
Cp	Btu/lb/R		0.4176
Cv	Btu/lbmol/R		12.534
Cv	Btu/lb/R		0.3588
Cp/Cv			1.1641
Density	lb/ft3		0.091182
Z-Factor			0.991021
Flowrate (T-P)	ft3/s		0.44822
Flowrate (STP)	MMSCFD		0.038355
Viscosity	cP		0.009578
Thermal Conductivity	Btu/hr/ft/R		0.012708
Critical Temperature (Cubic E	F	173.1526	
Critical Pressure (Cubic EOS)	psia	1347.8257	
Dew Point Temperature	F	70.0076	
Bubble Point Temperature	F	-259.4223	
Water Dew Point Temperature could not be calculated			
Stream Vapor Pressure	psia	1142.0302	
Vapor Sonic Velocity	ft/s	927.11	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	1964.1	
Heating Value (net)	Btu/SCF	1800.85	
Wobbe Number	Btu/SCF	1778.4	
Average Hydrogen Atoms		6.4895	
Average Carbon Atoms		2.2979	
Hydrogen to Carbon Ratio		2.8241	
Methane Number		41.29	
Motor Octane Number		98.76	

Details for Stream 3

Stream 3 (Condensate)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:
	Liquid 2 Visc:	NBS81	Liquid 2 ThC:	NBS81	Liquid 2 Den:

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %
46 : NITROGEN	0.001177	0	0.001177	0	0.001649
49 : CARBON DIOXIDE	0.020408	0	0.020408	0	0.028573
2 : METHANE	0.127825	0	0.127825	0	0.17897
3 : ETHANE	0.569239	0	0.569239	0	0.797002
4 : PROPANE	1.8824	0	1.8824	0	2.63559
5 : ISOBUTANE	0.809671	0	0.809671	0	1.13364
6 : N-BUTANE	2.67152	0	2.67152	0	3.74045
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	2.01059	0	2.01059	0	2.81506
8 : N-PENTANE	2.79809	0	2.79809	0	3.91766
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	5.49975	0	5.49975	0	7.7003
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.319065	0	0.319065	0	0.44673
38 : CYCLOHEXANE	0.80745	0	0.80745	0	1.13053
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	5.86829	0	5.86829	0	8.21631
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	1.37613	0	1.37613	0	1.92675
12 : N-OCTANE	5.00071	0	5.00071	0	7.00158
45 : ETHYL BENZENE	0.334749	0	0.334749	0	0.468689
43 : M-XYLENE	1.99067	0	1.99067	0	2.78717
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	4.51178	0	4.51178	0	6.31703
14 : N-DECANE	34.823	0	34.823	0	48.7563
62 : WATER	0	0	0	0	0
Total	71.4225	0	71.4225	0	100

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.032984	0	0.032984	0	0.000398
49 : CARBON DIOXIDE	0.89812	0	0.89812	0	0.01084
2 : METHANE	2.05069	0	2.05069	0	0.024751
3 : ETHANE	17.1159	0	17.1159	0	0.206586
4 : PROPANE	83.0027	0	83.0027	0	1.00183
5 : ISOBUTANE	47.0581	0	47.0581	0	0.567984
6 : N-BUTANE	155.269	0	155.269	0	1.87407
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	145.056	0	145.056	0	1.7508
8 : N-PENTANE	201.871	0	201.871	0	2.43655
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	473.924	0	473.924	0	5.72019
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	24.9216	0	24.9216	0	0.300799
38 : CYCLOHEXANE	67.9518	0	67.9518	0	0.820168

79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	587.991	0	587.991	0	7.09696
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	126.788	0	126.788	0	1.53032
12 : N-OCTANE	571.201	0	571.201	0	6.89431
45 : ETHYL BENZENE	35.537	0	35.537	0	0.428926
43 : M-XYLENE	211.329	0	211.329	0	2.55071
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	578.636	0	578.636	0	6.98405
14 : N-DECANE	4954.47	0	4954.47	0	59.7998
62 : WATER	0	0	0	0	0
Total	8285.11	0	8285.11	0	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.003085	0	0.003085	0	0.001649
49 : CARBON DIOXIDE	0.053472	0	0.053472	0	0.028573
2 : METHANE	0.334921	0	0.334921	0	0.17897
3 : ETHANE	1.4915	0	1.4915	0	0.797002
4 : PROPANE	4.9322	0	4.9322	0	2.63559
5 : ISOBUTANE	2.12147	0	2.12147	0	1.13364
6 : N-BUTANE	6.99982	0	6.99982	0	3.74045
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	5.26806	0	5.26806	0	2.81506
8 : N-PENTANE	7.33145	0	7.33145	0	3.91766
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	14.4102	0	14.4102	0	7.7003
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.836003	0	0.836003	0	0.44673
38 : CYCLOHEXANE	2.11565	0	2.11565	0	1.13053
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	15.3759	0	15.3759	0	8.21631
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	3.60568	0	3.60568	0	1.92675
12 : N-OCTANE	13.1027	0	13.1027	0	7.00158
45 : ETHYL BENZENE	0.877097	0	0.877097	0	0.468689
43 : M-XYLENE	5.21587	0	5.21587	0	2.78717
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	11.8216	0	11.8216	0	6.31703
14 : N-DECANE	91.2418	0	91.2418	0	48.7563
62 : WATER	0	0	0	0	0
Total	187.138	0	187.138	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.000655	0	0.000655	0	0.000353
49 : CARBON DIOXIDE	0.017519	0	0.017519	0	0.009425
2 : METHANE	0.109655	0	0.109655	0	0.05899
3 : ETHANE	0.770017	0	0.770017	0	0.41424
4 : PROPANE	2.6231	0	2.6231	0	1.41113
5 : ISOBUTANE	1.34041	0	1.34041	0	0.721091
6 : N-BUTANE	4.26271	0	4.26271	0	2.29318
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	3.7239	0	3.7239	0	2.00332
8 : N-PENTANE	5.12898	0	5.12898	0	2.7592
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0

52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	11.4443	0	11.4443	0	6.15659
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.451779	0	0.451779	0	0.24304
38 : CYCLOHEXANE	1.3907	0	1.3907	0	0.748147
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	13.7001	0	13.7001	0	7.37014
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	2.3319	0	2.3319	0	1.25448
12 : N-OCTANE	12.9555	0	12.9555	0	6.96956
45 : ETHYL BENZENE	0.6537	0	0.6537	0	0.351666
43 : M-XYLENE	3.90042	0	3.90042	0	2.09828
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	12.8535	0	12.8535	0	6.91468
14 : N-DECANE	108.228	0	108.228	0	58.2225
62 : WATER	0	0	0	0	0
Total	185.886	0	185.886	0	100

Properties

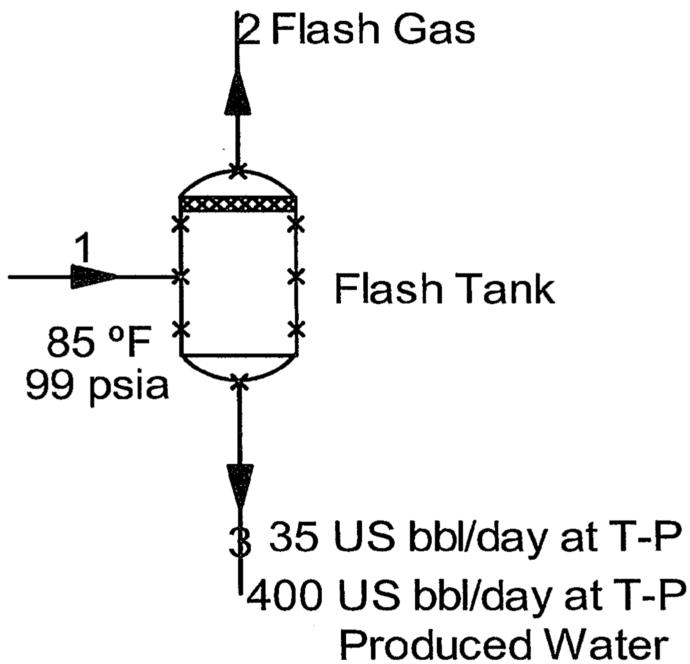
Temperature	F	70	
Pressure	psia	14.7	
Enthalpy	Btu/hr	-1152303	
Entropy	Btu/hr/R	-1281.01	
Vapor Fraction		0	
		Total	Liquid 1
Flowrate	lbmol/hr	71.4225	71.4225
Flowrate	lb/hr	8285.108	8285.108
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		116.0014	116.0014
Enthalpy	Btu/lbmol	-16133.6115	-16133.6115
Enthalpy	Btu/lb	-139.0812	-139.0812
Entropy	Btu/lbmol/R	-17.9357	-17.9357
Entropy	Btu/lb/R	-0.154616	-0.154616
Cp	Btu/lbmol/R		57.4199
Cp	Btu/lb/R		0.495
Cv	Btu/lbmol/R		50.5021
Cv	Btu/lb/R		0.4354
Cp/Cv			1.137
Density	lb/ft3		44.2726
Z-Factor			0.006777
Flowrate (T-P)	gal/min		23.333
Flowrate (STP)	gal/min		23.1755
Specific Gravity	GPA STP		0.714658
Viscosity	cP		0.515961
Thermal Conductivity	Btu/hr/ft/R		0.065866
Surface Tension	dyne/cm		21.2374
Reid Vapor Pressure (ASTM-A	psia		11.05
True Vapor Pressure at 100 F	psia		19.47
Critical Temperature (Cubic E	F	599.2774	
Critical Pressure (Cubic EOS)	psia	431.1843	
Dew Point Temperature	F	308.9403	
Bubble Point Temperature	F	69.9748	
Water Dew Point Temperature could not be calculated			
Stream Vapor Pressure	psia	14.7	
Latent Heat of Vaporization (N	Btu/lb	129.9117	
Latent Heat of Vaporization (P	Btu/lb	259.9742	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	6307.05	
Heating Value (net)	Btu/SCF	5858.11	
Wobbe Number	Btu/SCF	2964.64	
Average Hydrogen Atoms		17.8461	
Average Carbon Atoms		8.1601	
Hydrogen to Carbon Ratio		2.187	

DESIGN II for Windows

SUGARKANE CTB - PW SUMMARY REPORT

Simulation Result: SOLUTION REACHED

Problem:
Project:
Task:
By:
At: 7-Feb-12 10:07 AM



Details for Stream 1

Stream 1 (Strm 1)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	STEAM	Liquid 2 ThC:	STEAM	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.00157	0	0.001004	0.000566	0.00048	76.3973
49 : CARBON DIOXIDE	0.004087	0	0.000837	0.00325	0.00125	10.619
2 : METHANE	0.068699	0	0.047705	0.020994	0.02101	30.7589
3 : ETHANE	0.068045	0	0.063017	0.005028	0.02081	5.34955
4 : PROPANE	0.118336	0	0.115385	0.00295	0.03619	1.50467
5 : ISOBUTANE	0.0412	0	0.041058	0.000142	0.0126	0.624209
6 : N-BUTANE	0.130532	0	0.130194	0.000338	0.03992	0.468635
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	0.288569
7 : ISOPENTANE	0.090869	0	0.09078	0.00008849	0.02779	0.175808
8 : N-PENTANE	0.125235	0	0.125138	0.00009643	0.0383	0.138973
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.07402
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.054839
52 : 2-METHYLPENTANE	0	0	0	0	0	0.049715
53 : 3-METHYLPENTANE	0	0	0	0	0	0.044482
10 : N-HEXANE	0.240235	0	0.240176	0.00005906	0.07347	0.044351
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.032828
40 : BENZENE	0.01393	0	0.013926	0.000003159	0.00426	0.040916
38 : CYCLOHEXANE	0.035183	0	0.035177	0.000006542	0.01076	0.033541
79 : 2-METHYLHEXANE	0	0	0	0	0	0.014751
80 : 3-METHYLHEXANE	0	0	0	0	0	0.014682
11 : N-HEPTANE	0.254492	0	0.254471	0.00002059	0.07783	0.01459
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.011357
41 : TOLUENE	0.059642	0	0.059638	0.000003774	0.01824	0.011414
12 : N-OCTANE	0.216398	0	0.216392	0.000005859	0.06618	0.004883
45 : ETHYL BENZENE	0.014485	0	0.014485	3.703E-07	0.00443	0.00461
43 : M-XYLENE	0.086128	0	0.086126	0.000001852	0.02634	0.003879
42 : O-XYLENE	0	0	0	0	0	0.001809
13 : N-NONANE	0.195111	0	0.19511	0.000001814	0.05967	0.001677
14 : N-DECANE	1.5056	0	1.50559	0.000004748	0.46045	0.000569
62 : WATER	323.714	0	0.003078	323.711	99	6.53687
Total	326.984	0	3.23929	323.745	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.043968	0	0.028119	0.015848	0.00071
49 : CARBON DIOXIDE	0.179877	0	0.036827	0.14305	0.002903
2 : METHANE	1.10214	0	0.765337	0.336805	0.017787
3 : ETHANE	2.04599	0	1.89481	0.151178	0.033019
4 : PROPANE	5.21789	0	5.08781	0.130081	0.084209
5 : ISOBUTANE	2.39454	0	2.38628	0.008259	0.038644
6 : N-BUTANE	7.58652	0	7.56686	0.019662	0.122435
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	6.55583	0	6.54944	0.006384	0.105801
8 : N-PENTANE	9.0352	0	9.02824	0.006957	0.145815
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	20.7015	0	20.6965	0.00509	0.334092
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	1.08801	0	1.08776	0.000247	0.017559
38 : CYCLOHEXANE	2.9609	0	2.96035	0.000551	0.047785
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	25.4996	0	25.4975	0.002063	0.411525
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	5.49505	0	5.4947	0.000348	0.088682
12 : N-OCTANE	24.7178	0	24.7172	0.000669	0.398909
45 : ETHYL BENZENE	1.53777	0	1.53773	0.00003931	0.024817
43 : M-XYLENE	9.14331	0	9.14311	0.000197	0.147559
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	25.023	0	25.0228	0.000233	0.403834
14 : N-DECANE	214.21	0	214.21	0.000676	3.45704
62 : WATER	5831.82	0	0.055451	5831.77	94.1169
Total	6196.36	0	363.767	5832.59	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.002757	0	0.002596	0.000161	0.002746
49 : CARBON DIOXIDE	0.003088	0	0.002164	0.000924	0.003076
2 : METHANE	0.129342	0	0.123376	0.005966	0.128856
3 : ETHANE	0.164405	0	0.162977	0.001429	0.163788
4 : PROPANE	0.29925	0	0.298411	0.000838	0.298126
5 : ISOBUTANE	0.106225	0	0.106184	0.00004038	0.105826
6 : N-BUTANE	0.336805	0	0.336709	0.00009614	0.33554
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.234803	0	0.234777	0.00002515	0.233921
8 : N-PENTANE	0.323662	0	0.323635	0.0000274	0.322446
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.621163	0	0.621147	0.00001678	0.61883
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.036017	0	0.036017	8.978E-07	0.035882
38 : CYCLOHEXANE	0.090977	0	0.090975	0.000001859	0.090635
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.658122	0	0.658116	0.00000585	0.65565
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.154238	0	0.154237	0.000001073	0.153659
12 : N-OCTANE	0.559638	0	0.559636	0.000001665	0.557536
45 : ETHYL BENZENE	0.037461	0	0.037461	1.052E-07	0.037321
43 : M-XYLENE	0.22274	0	0.22274	5.264E-07	0.221903
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.504595	0	0.504595	5.154E-07	0.5027
14 : N-DECANE	3.89379	0	3.89378	0.000001349	3.87916
62 : WATER	91.998	0	0.00796	91.99	91.6524
Total	100.377	0	8.3775	91.9996	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.000874	0	0.000559	0.000315	0.000859
49 : CARBON DIOXIDE	0.003509	0	0.000718	0.00279	0.003448
2 : METHANE	0.058934	0	0.040924	0.01801	0.057912
3 : ETHANE	0.092046	0	0.085245	0.006801	0.09045
4 : PROPANE	0.164899	0	0.160788	0.004111	0.16204
5 : ISOBUTANE	0.068207	0	0.067971	0.000235	0.067024
6 : N-BUTANE	0.208278	0	0.207739	0.00054	0.204667
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.168302	0	0.168138	0.000164	0.165384
8 : N-PENTANE	0.229559	0	0.229382	0.000177	0.225579
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.499899	0	0.499776	0.000123	0.491232
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.019723	0	0.019719	0.000004474	0.019381
38 : CYCLOHEXANE	0.060598	0	0.060587	0.00001127	0.059547
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.594136	0	0.594088	0.00004806	0.583835
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.101065	0	0.101059	0.000006396	0.099313
12 : N-OCTANE	0.560629	0	0.560614	0.00001518	0.550909
45 : ETHYL BENZENE	0.028287	0	0.028286	0.000000723	0.027797
43 : M-XYLENE	0.168755	0	0.168751	0.00000363	0.165829
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.555846	0	0.555841	0.000005167	0.546209
14 : N-DECANE	4.67931	0	4.67929	0.00001476	4.59818
62 : WATER	93.5015	0	0.000889	93.5006	91.8804
Total	101.764	0	8.23037	93.534	100

Properties

Temperature	F	85		
Pressure	psia	98.696		
Enthalpy	Btu/hr	-6007289		
Entropy	Btu/hr/R	-9564.731		
Vapor Fraction		0		
		Total	Liquid 1	Liquid 2
Flowrate	lbmol/hr	326.984	3.2393	323.7447
Flowrate	lb/hr	6196.3612	363.7665	5832.5946
Mole Fraction		1	0.009907	0.990093
Mass Fraction		1	0.058706	0.941294
Molecular Weight		18.95	112.2982	18.016
Enthalpy	Btu/lbmol	-18371.8148	-14752.178	-18408.0317
Enthalpy	Btu/lb	-969.4866	-131.3661	-1021.7584
Entropy	Btu/lbmol/R	-29.2514	-15.8869	-29.3851
Entropy	Btu/lb/R	-1.5436	-0.141471	-1.6311
Cp	Btu/lbmol/R		56.9172	17.9928
Cp	Btu/lb/R		0.5068	0.9987
Cv	Btu/lbmol/R		49.8765	17.7287
Cv	Btu/lb/R		0.4442	0.984
Cp/Cv			1.1411	1.0149
Density	lb/ft3		43.4219	63.3981
Z-Factor			0.043675	0.004799
Flowrate (T-P)	gal/min		1.0445	11.4708
Flowrate (STP)	gal/min		1.0261	11.6614
Specific Gravity	GPA STP		0.708682	0.999863
Viscosity	cP		0.535142	0.807243
Thermal Conductivity	Btu/hr/ft/R		0.067989	0.355244
Surface Tension	dyne/cm		19.4988	71.2853
Reid Vapor Pressure (ASTM-A)		unconverged		
True Vapor Pressure at 100 F	psia		73.11	
Critical Temperature (Cubic E	F	695.2244		
Critical Pressure (Cubic EOS)	psia	3254.5678		
Dew Point Temperature	F	322.9413		
Bubble Point Temperature	F	152.3111		
Water Dew Point Temperature could not be calculated				
Liquid 2 Freezing Point	F	31.9059		
Stream Vapor Pressure	psia	66.7763		
Latent Heat of Vaporization (N	Btu/lb	857.1977		
Latent Heat of Vaporization (P	Btu/lb	1091.036		
CO2 Freeze Up		No		
Heating Value (gross)	Btu/SCF	60.65		
Heating Value (net)	Btu/SCF	56.32		
Wobbe Number	Btu/SCF	74.37		
Average Hydrogen Atoms		2.1521		
Average Carbon Atoms		0.0783		
Hydrogen to Carbon Ratio		27.4733		

Details for Stream 2

Stream 2 (Flash Gas)

Thermodynamic Methods	K-Value: Vapor Visc:	PENG-ROB NBS81	Enthalpy: Vapor ThC:	PENG-ROB NBS81	Density: Vapor Den:	STD STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Incipient Liquid 1 mol fra	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.001486	0.001486	0.00001636	0	0.827733	506.086
49 : CARBON DIOXIDE	0.001641	0.001641	0.000148	0	0.913919	61.6028
2 : METHANE	0.060745	0.060745	0.001745	0	33.839	193.912
3 : ETHANE	0.041961	0.041961	0.007808	0	23.3751	29.9379
4 : PROPANE	0.035937	0.035937	0.025989	0	20.0193	7.70283
5 : ISOBUTANE	0.006111	0.006111	0.011335	0	3.40413	3.00307
6 : N-BUTANE	0.014829	0.014829	0.037403	0	8.26093	2.20861
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	1.48838
7 : ISOPENTANE	0.003894	0.003894	0.028151	0	2.16904	0.770489
8 : N-PENTANE	0.00421	0.00421	0.039178	0	2.34525	0.59861
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.360909
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.263381
52 : 2-METHYLPENTANE	0	0	0	0	0	0.236664
53 : 3-METHYLPENTANE	0	0	0	0	0	0.210746
10 : N-HEXANE	0.002438	0.002438	0.077008	0	1.3584	0.176398
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.154099
40 : BENZENE	0.000134	0.000134	0.004468	0	0.074586	0.166949
38 : CYCLOHEXANE	0.000272	0.000272	0.011306	0	0.151666	0.134146
79 : 2-METHYLHEXANE	0	0	0	0	0	0.065693
80 : 3-METHYLHEXANE	0	0	0	0	0	0.066054
11 : N-HEPTANE	0.000785	0.000785	0.082169	0	0.43739	0.053231
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.051298
41 : TOLUENE	0.000147	0.000147	0.019269	0	0.082123	0.04262
12 : N-OCTANE	0.000207	0.000207	0.070021	0	0.115056	0.016432
45 : ETHYL BENZENE	0.00001345	0.00001345	0.004687	0	0.007494	0.015987
43 : M-XYLENE	0.0000669	0.0000669	0.027874	0	0.037266	0.01337
42 : O-XYLENE	0	0	0	0	0	0.007514
13 : N-NONANE	0.00005897	0.00005897	0.063175	0	0.032852	0.0052
14 : N-DECANE	0.000142	0.000142	0.487599	0	0.079056	0.001621
62 : WATER	0.004433	0.004433	0.00065	0	2.46969	37.9843
Total	0.179511	0.179511	1	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Incipient Liquid 1 mass fra	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.041624	0.041624	0.000004	0	0.670084
49 : CARBON DIOXIDE	0.0722	0.0722	0.000056	0	1.16231
2 : METHANE	0.974525	0.974525	0.000241	0	15.6883
3 : ETHANE	1.26168	1.26168	0.002024	0	20.311
4 : PROPANE	1.58459	1.58459	0.00988	0	25.5094
5 : ISOBUTANE	0.355158	0.355158	0.00568	0	5.71748
6 : N-BUTANE	0.861875	0.861875	0.01874	0	13.8748
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.280911	0.280911	0.01751	0	4.52223
8 : N-PENTANE	0.303732	0.303732	0.02437	0	4.88961
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.210128	0.210128	0.05721	0	3.38273
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.010458	0.010458	0.003008	0	0.168355
38 : CYCLOHEXANE	0.022912	0.022912	0.008203	0	0.368848
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.078672	0.078672	0.07098	0	1.26649
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.013582	0.013582	0.01531	0	0.218654
12 : N-OCTANE	0.023592	0.023592	0.06895	0	0.379788
45 : ETHYL BENZENE	0.001428	0.001428	0.00429	0	0.022989
43 : M-XYLENE	0.007102	0.007102	0.02551	0	0.114327
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.007563	0.007563	0.06985	0	0.121758
14 : N-DECANE	0.020191	0.020191	0.5981	0	0.325042
62 : WATER	0.079868	0.079868	0.000101	0	1.28575
Total	6.21179	6.21179	1	0	100
	Total VOC	3.781894			

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.569188	0.569188	0	0	0.827733
49 : CARBON DIOXIDE	0.628453	0.628453	0	0	0.913919
2 : METHANE	23.2693	23.2693	0	0	33.839
3 : ETHANE	16.0738	16.0738	0	0	23.3751
4 : PROPANE	13.7662	13.7662	0	0	20.0193
5 : ISOBUTANE	2.34083	2.34083	0	0	3.40413
6 : N-BUTANE	5.68059	5.68059	0	0	8.26093
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	1.49153	1.49153	0	0	2.16904
8 : N-PENTANE	1.6127	1.6127	0	0	2.34525
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.934099	0.934099	0	0	1.3584
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.051289	0.051289	0	0	0.074586
38 : CYCLOHEXANE	0.104293	0.104293	0	0	0.151666
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.30077	0.30077	0	0	0.43739
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.056472	0.056472	0	0	0.082123
12 : N-OCTANE	0.079118	0.079118	0	0	0.115056
45 : ETHYL BENZENE	0.005153	0.005153	0	0	0.007494
43 : M-XYLENE	0.025626	0.025626	0	0	0.037266
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.022591	0.022591	0	0	0.032852
14 : N-DECANE	0.054362	0.054362	0	0	0.079056
62 : WATER	1.69827	1.69827	0	0	2.46969
Total	68.7646	68.7646	0	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.563862	0.563862	0	0	0.827733
49 : CARBON DIOXIDE	0.622573	0.622573	0	0	0.913919
2 : METHANE	23.0516	23.0516	0	0	33.839
3 : ETHANE	15.9234	15.9234	0	0	23.3751
4 : PROPANE	13.6374	13.6374	0	0	20.0193
5 : ISOBUTANE	2.31893	2.31893	0	0	3.40413
6 : N-BUTANE	5.62744	5.62744	0	0	8.26093
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	1.47758	1.47758	0	0	2.16904
8 : N-PENTANE	1.59761	1.59761	0	0	2.34525
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.92536	0.92536	0	0	1.3584
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.050809	0.050809	0	0	0.074586
38 : CYCLOHEXANE	0.103317	0.103317	0	0	0.151666
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.297956	0.297956	0	0	0.43739
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.055943	0.055943	0	0	0.082123
12 : N-OCTANE	0.078378	0.078378	0	0	0.115056
45 : ETHYL BENZENE	0.005105	0.005105	0	0	0.007494
43 : M-XYLENE	0.025386	0.025386	0	0	0.037266
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.022379	0.022379	0	0	0.032852
14 : N-DECANE	0.053854	0.053854	0	0	0.079056
62 : WATER	1.68238	1.68238	0	0	2.46969
Total	68.1212	68.1212	0	0	100

Properties

Temperature	F	70	
Pressure	psia	14.7	
Enthalpy	Btu/hr	90.71079	
Entropy	Btu/hr/R	0.8297401	
Vapor Fraction		1	
		Total	Vapor
Flowrate	lbmol/hr	0.179511	0.179511
Flowrate	lb/hr	6.2118	6.2118
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		34.6041	34.6041
Enthalpy	Btu/lbmol	505.323	505.323
Enthalpy	Btu/lb	14.603	14.603
Entropy	Btu/lbmol/R	4.6222	4.6222
Entropy	Btu/lb/R	0.133575	0.133575
Cp	Btu/lbmol/R		14.5338
Cp	Btu/lb/R		0.42
Cv	Btu/lbmol/R		12.4762
Cv	Btu/lb/R		0.3605
Cp/Cv			1.1649
Density	lb/ft3		0.090334
Z-Factor			0.990803
Flowrate (T-P)	ft3/s		0.019101
Flowrate (STP)	MMSCFD		0.001635
Viscosity	cP		0.009488
Thermal Conductivity	Btu/hr/ft/R		0.012672
Critical Temperature (Cubic E	F	183.9023	
Critical Pressure (Cubic EOS)	psia	1379.435	
Dew Point Temperature	F	69.9999	
Bubble Point Temperature	F	-259.9682	
Water Dew Point	F	71.5716	
Stream Vapor Pressure	psia	1136.0205	
Vapor Sonic Velocity	ft/s	931.68	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	1940.02	
Heating Value (net)	Btu/SCF	1778.92	
Wobbe Number	Btu/SCF	1764.79	
Average Hydrogen Atoms		6.4538	
Average Carbon Atoms		2.263	
Hydrogen to Carbon Ratio		2.8518	
Methane Number		41.76	
Motor Octane Number		99.05	

Details for Stream 3

Stream 3 (Produced Water)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	STEAM	Liquid 2 ThC:	STEAM	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.00008366	0	0.0000505	0.00003316	0.0000256	
49 : CARBON DIOXIDE	0.002447	0	0.000458	0.001989	0.000749	
2 : METHANE	0.007955	0	0.005388	0.002567	0.002434	
3 : ETHANE	0.026085	0	0.024107	0.001978	0.007982	
4 : PROPANE	0.082399	0	0.080242	0.002157	0.025213	
5 : ISOBUTANE	0.035089	0	0.034998	0.00009106	0.010737	
6 : N-BUTANE	0.115703	0	0.115482	0.000221	0.035404	
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	
7 : ISOPENTANE	0.086975	0	0.086917	0.00005802	0.026614	
8 : N-PENTANE	0.121025	0	0.120962	0.00006273	0.037033	
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	
52 : 2-METHYLPENTANE	0	0	0	0	0	
53 : 3-METHYLPENTANE	0	0	0	0	0	
10 : N-HEXANE	0.237797	0	0.23776	0.00003634	0.072764	
37 : METHYLCYCLOPENTA	0	0	0	0	0	
40 : BENZENE	0.013796	0	0.013794	0.000001995	0.004221	
38 : CYCLOHEXANE	0.034911	0	0.034907	0.000004057	0.010683	
79 : 2-METHYLHEXANE	0	0	0	0	0	
80 : 3-METHYLHEXANE	0	0	0	0	0	
11 : N-HEPTANE	0.253707	0	0.253695	0.0000117	0.077633	
39 : METHYLCYCLOHEXAN	0	0	0	0	0	
41 : TOLUENE	0.059494	0	0.059492	0.000002197	0.018205	
12 : N-OCTANE	0.216192	0	0.216188	0.000003078	0.066153	
45 : ETHYL BENZENE	0.014472	0	0.014472	2.004E-07	0.004428	
43 : M-XYLENE	0.086061	0	0.08606	9.968E-07	0.026334	
42 : O-XYLENE	0	0	0	0	0	
13 : N-NONANE	0.195052	0	0.195052	8.788E-07	0.059685	
14 : N-DECANE	1.50546	0	1.50545	0.000002115	0.46066	
62 : WATER	323.71	0	0.002007	323.708	99.053	
Total	326.804	0	3.08749	323.717	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.002343	0	0.001415	0.000929	0.00003786
49 : CARBON DIOXIDE	0.107677	0	0.020158	0.087519	0.001739
2 : METHANE	0.127617	0	0.086437	0.04118	0.002062
3 : ETHANE	0.784311	0	0.72484	0.059471	0.01267
4 : PROPANE	3.63329	0	3.5382	0.095096	0.058695
5 : ISOBUTANE	2.03939	0	2.03409	0.005292	0.032946
6 : N-BUTANE	6.72465	0	6.7118	0.012843	0.108635
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	6.27491	0	6.27073	0.004186	0.101369
8 : N-PENTANE	8.73146	0	8.72694	0.004526	0.141054
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	20.4914	0	20.4883	0.003131	0.331033
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	1.07755	0	1.07739	0.000156	0.017407
38 : CYCLOHEXANE	2.93799	0	2.93765	0.000341	0.047462
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	25.4209	0	25.4197	0.001172	0.410667
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	5.48146	0	5.48126	0.000202	0.088551
12 : N-OCTANE	24.6943	0	24.6939	0.000352	0.398928
45 : ETHYL BENZENE	1.53634	0	1.53832	0.00002128	0.024819
43 : M-XYLENE	9.1362	0	9.1361	0.000106	0.147593
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	25.0155	0	25.0154	0.000113	0.404117
14 : N-DECANE	214.19	0	214.19	0.000301	3.46018
62 : WATER	5831.74	0	0.036165	5831.71	94.21
Total	6190.15	0	358.127	5832.02	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.000142	0	0.000132	0.000009588	0.000139
49 : CARBON DIOXIDE	0.001775	0	0.0012	0.000575	0.001745
2 : METHANE	0.014855	0	0.014113	0.000742	0.014608
3 : ETHANE	0.063717	0	0.063145	0.000572	0.062656
4 : PROPANE	0.210809	0	0.210185	0.000624	0.207299
5 : ISOBUTANE	0.0917	0	0.091674	0.00002633	0.090173
6 : N-BUTANE	0.302556	0	0.302492	0.0000639	0.297517
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.227687	0	0.22767	0.00001678	0.223895
8 : N-PENTANE	0.316865	0	0.316847	0.00001814	0.311589
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.622797	0	0.622787	0.00001051	0.612426
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.036131	0	0.036131	5.769E-07	0.03553
38 : CYCLOHEXANE	0.091437	0	0.091435	0.000001173	0.089914
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.664529	0	0.664525	0.000003383	0.653463
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.155834	0	0.155833	6.352E-07	0.153239
12 : N-OCTANE	0.566282	0	0.566281	8.899E-07	0.556853
45 : ETHYL BENZENE	0.037907	0	0.037907	5.796E-08	0.037276
43 : M-XYLENE	0.225424	0	0.225424	2.882E-07	0.22167
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.510916	0	0.510916	2.541E-07	0.502408
14 : N-DECANE	3.94337	0	3.94337	6.115E-07	3.8777
62 : WATER	93.6087	0	0.005258	93.6034	92.0499
Total	101.693	0	8.08732	93.6061	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.00004657	0	0.00002811	0.00001846	0.00004586
49 : CARBON DIOXIDE	0.0021	0	0.000393	0.001707	0.002068
2 : METHANE	0.006824	0	0.004622	0.002202	0.00672
3 : ETHANE	0.035285	0	0.032609	0.002675	0.034748
4 : PROPANE	0.114822	0	0.111816	0.003005	0.113076
5 : ISOBUTANE	0.05809	0	0.057939	0.000151	0.057207
6 : N-BUTANE	0.184617	0	0.184264	0.000353	0.181809
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.161091	0	0.160983	0.000107	0.158641
8 : N-PENTANE	0.221842	0	0.221727	0.000115	0.218469
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.494824	0	0.494749	0.00007561	0.4873
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.019534	0	0.019531	0.000002825	0.019237
38 : CYCLOHEXANE	0.060129	0	0.060122	0.000006987	0.059215
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.592303	0	0.592275	0.00002731	0.583296
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.100815	0	0.100812	0.000003722	0.099282
12 : N-OCTANE	0.560094	0	0.560086	0.000007973	0.551577
45 : ETHYL BENZENE	0.028261	0	0.02826	3.914E-07	0.027831
43 : M-XYLENE	0.168624	0	0.168622	0.000001953	0.16606
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.555678	0	0.555676	0.000002504	0.547229
14 : N-DECANE	4.67887	0	4.67886	0.000006572	4.60772
62 : WATER	93.5002	0	0.00058	93.4996	92.0785
Total	101.544	0	8.03395	93.5101	100

Properties

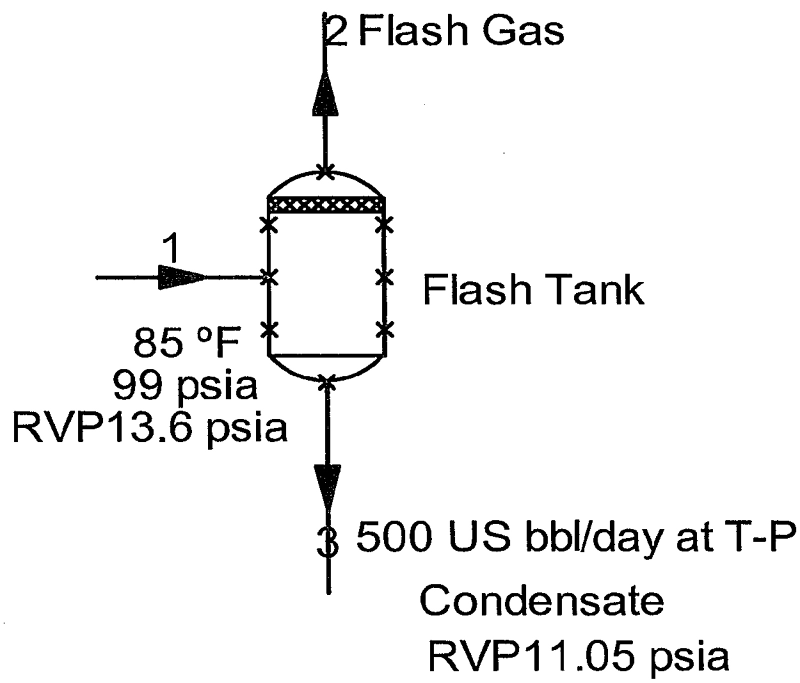
Temperature	F	70		
Pressure	psia	14.7		
Enthalpy	Btu/hr	-6098050		
Entropy	Btu/hr/R	-9731.118		
Vapor Fraction		0		
		Total	Liquid 1	Liquid 2
Flowrate	lbmol/hr	326.8045	3.0875	323.717
Flowrate	lb/hr	6190.1494	358.1267	5832.0226
Mole Fraction		1	0.009448	0.990552
Mass Fraction		1	0.057854	0.942146
Molecular Weight		18.9414	115.993	18.0158
Enthalpy	Btu/lbmol	-18659.6272	-16137.915	-18683.6783
Enthalpy	Btu/lb	-985.1216	-139.1284	-1037.0714
Entropy	Btu/lbmol/R	-29.7766	-17.9358	-29.8895
Entropy	Btu/lb/R	-1.572	-0.154628	-1.6591
Cp	Btu/lbmol/R		57.5519	17.9991
Cp	Btu/lb/R		0.4962	0.9991
Cv	Btu/lbmol/R		50.6338	17.8638
Cv	Btu/lb/R		0.4365	0.9916
Cp/Cv			1.1366	1.0076
Density	lb/ft3		44.2825	62.3039
Z-Factor			0.006775	0.0007479
Flowrate (T-P)	gal/min		1.0084	11.6711
Flowrate (STP)	gal/min		1.0016	11.6584
Specific Gravity	GPA STP		0.714752	1
Viscosity	cP		0.555862	0.975963
Thermal Conductivity	Btu/hr/ft/R		0.065905	0.346918
Surface Tension	dyne/cm		21.2845	72.5713
Reid Vapor Pressure (ASTM-A)		unconverged		
True Vapor Pressure at 100 F	psia		20.13	
Critical Temperature (Cubic E	F	695.4634		
Critical Pressure (Cubic EOS)	psia	3249.6418		
Dew Point Temperature	F	211.5526		
Bubble Point Temperature	F	70.2894		
Water Dew Point Temperature could not be calculated				
Liquid 2 Freezing Point	F	31.986		
Stream Vapor Pressure	psia	14.7		
Latent Heat of Vaporization (N	Btu/lb	925.8833		
Latent Heat of Vaporization (P	Btu/lb	1063.375		
CO2 Freeze Up		No		
Heating Value (gross)	Btu/SCF	59.62		
Heating Value (net)	Btu/SCF	55.37		
Wobbe Number	Btu/SCF	73.12		
Average Hydrogen Atoms		2.1498		
Average Carbon Atoms		0.0771		
Hydrogen to Carbon Ratio		27.8701		

DESIGN II for Windows

CONDENSATE SUMMARY REPORT

Simulation Result: SOLUTION REACHED

Problem:
Project:
Task:
By:
At: 8-Feb-12 3:06 PM



Details for Stream 1

Stream 1 (Strm 1)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	STEAM	Liquid 2 ThC:	STEAM	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.022707	0	0.022707	0	0.048001	
49 : CARBON DIOXIDE	0.059134	0	0.059134	0	0.125003	
2 : METHANE	0.993916	0	0.993916	0	2.10104	
3 : ETHANE	0.984455	0	0.984455	0	2.08104	
4 : PROPANE	1.71203	0	1.71203	0	3.61907	
5 : ISOBUTANE	0.596066	0	0.596066	0	1.26003	
6 : N-BUTANE	1.88849	0	1.88849	0	3.99208	
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	
7 : ISOPENTANE	1.31466	0	1.31466	0	2.77906	
8 : N-PENTANE	1.81185	0	1.81185	0	3.83008	
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	
52 : 2-METHYLPENTANE	0	0	0	0	0	
53 : 3-METHYLPENTANE	0	0	0	0	0	
10 : N-HEXANE	3.47563	0	3.47563	0	7.34715	
37 : METHYLCYCLOPENTA	0	0	0	0	0	
40 : BENZENE	0.201527	0	0.201527	0	0.426009	
38 : CYCLOHEXANE	0.509021	0	0.509021	0	1.07602	
79 : 2-METHYLHEXANE	0	0	0	0	0	
80 : 3-METHYLHEXANE	0	0	0	0	0	
11 : N-HEPTANE	3.68189	0	3.68189	0	7.78316	
39 : METHYLCYCLOHEXAN	0	0	0	0	0	
41 : TOLUENE	0.862876	0	0.862876	0	1.82404	
12 : N-OCTANE	3.13077	0	3.13077	0	6.61813	
45 : ETHYL BENZENE	0.209569	0	0.209569	0	0.443009	
43 : M-XYLENE	1.24606	0	1.24606	0	2.63405	
42 : O-XYLENE	0	0	0	0	0	
13 : N-NONANE	2.8228	0	2.8228	0	5.96712	
14 : N-DECANE	21.7824	0	21.7824	0	46.0459	
62 : WATER	0	0	0	0	0	
Total	47.3059	0	47.3059	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.636108	0	0.636108	0	0.012061
49 : CARBON DIOXIDE	2.6024	0	2.6024	0	0.049344
2 : METHANE	15.9454	0	15.9454	0	0.302338
3 : ETHANE	29.6006	0	29.6006	0	0.561253
4 : PROPANE	75.4904	0	75.4904	0	1.43136
5 : ISOBUTANE	34.6434	0	34.6434	0	0.656868
6 : N-BUTANE	109.759	0	109.759	0	2.08113
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	94.8472	0	94.8472	0	1.79839
8 : N-PENTANE	130.718	0	130.718	0	2.47852
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	299.502	0	299.502	0	5.67882
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	15.7409	0	15.7409	0	0.298461
38 : CYCLOHEXANE	42.8372	0	42.8372	0	0.812231
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	368.918	0	368.918	0	6.99501
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	79.5003	0	79.5003	0	1.50739
12 : N-OCTANE	357.609	0	357.609	0	6.78057
45 : ETHYL BENZENE	22.2479	0	22.2479	0	0.421839
43 : M-XYLENE	132.282	0	132.282	0	2.50818
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	362.024	0	362.024	0	6.86429
14 : N-DECANE	3099.12	0	3099.12	0	58.7619
62 : WATER	0	0	0	0	0
Total	5274.02	0	5274.02	0	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.058494	0	0.058494	0	0.048001
49 : CARBON DIOXIDE	0.152327	0	0.152327	0	0.125003
2 : METHANE	2.56032	0	2.56032	0	2.10104
3 : ETHANE	2.53594	0	2.53594	0	2.08104
4 : PROPANE	4.41018	0	4.41018	0	3.61907
5 : ISOBUTANE	1.53546	0	1.53546	0	1.26003
6 : N-BUTANE	4.86472	0	4.86472	0	3.99208
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	3.38654	0	3.38654	0	2.77906
8 : N-PENTANE	4.66731	0	4.66731	0	3.83008
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	8.95318	0	8.95318	0	7.34715
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.519131	0	0.519131	0	0.426009
38 : CYCLOHEXANE	1.31123	0	1.31123	0	1.07602
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	9.4845	0	9.4845	0	7.78316
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	2.22276	0	2.22276	0	1.82404
12 : N-OCTANE	8.06481	0	8.06481	0	6.61813
45 : ETHYL BENZENE	0.539848	0	0.539848	0	0.443009
43 : M-XYLENE	3.20984	0	3.20984	0	2.63405
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	7.27149	0	7.27149	0	5.96712
14 : N-DECANE	56.1112	0	56.1112	0	46.0459
62 : WATER	0	0	0	0	0
Total	121.859	0	121.859	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.012641	0	0.012641	0	0.010574
49 : CARBON DIOXIDE	0.050763	0	0.050763	0	0.042464
2 : METHANE	0.852636	0	0.852636	0	0.713241
3 : ETHANE	1.33169	0	1.33169	0	1.11397
4 : PROPANE	2.3857	0	2.3857	0	1.99567
5 : ISOBUTANE	0.986787	0	0.986787	0	0.825461
6 : N-BUTANE	3.01329	0	3.01329	0	2.52066
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	2.43493	0	2.43493	0	2.03685
8 : N-PENTANE	3.32117	0	3.32117	0	2.77821
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	7.23234	0	7.23234	0	6.04995
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.285351	0	0.285351	0	0.2387
38 : CYCLOHEXANE	0.876708	0	0.876708	0	0.733378
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	8.59573	0	8.59573	0	7.19044
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	1.46217	0	1.46217	0	1.22313
12 : N-OCTANE	8.11097	0	8.11097	0	6.78493
45 : ETHYL BENZENE	0.409248	0	0.409248	0	0.342341
43 : M-XYLENE	2.44148	0	2.44148	0	2.04233
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	8.04177	0	8.04177	0	6.72705
14 : N-DECANE	67.6985	0	67.6985	0	56.6307
62 : WATER	0	0	0	0	0
Total	119.544	0	119.544	0	100

Properties

Temperature	F	85	
Pressure	psia	98.696	
Enthalpy	Btu/hr	-692132.6	
Entropy	Btu/hr/R	-746.8197	
Vapor Fraction		0	
		Total	Liquid 1
Flowrate	lbmol/hr	47.3059	47.3059
Flowrate	lb/hr	5274.0194	5274.0194
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		111.4876	111.4876
Enthalpy	Btu/lbmol	-14631.0071	-14631.0071
Enthalpy	Btu/lb	-131.2344	-131.2344
Entropy	Btu/lbmol/R	-15.787	-15.787
Entropy	Btu/lb/R	-0.141604	-0.141604
Cp	Btu/lbmol/R		56.3698
Cp	Btu/lb/R		0.5056
Cv	Btu/lbmol/R		49.3271
Cv	Btu/lb/R		0.4424
Cp/Cv			1.1428
Density	lb/ft3		43.2796
Z-Factor			0.043502
Flowrate (T-P)	gal/min		15.1938
Flowrate (STP)	gal/min		14.9042
Specific Gravity	GPA STP		0.707396
Viscosity	cP		0.495811
Thermal Conductivity	Btu/hr/ft/R		0.068329
Surface Tension	dyne/cm		19.1391
Reid Vapor Pressure (ASTM-A	psia		13.6
True Vapor Pressure at 100 F	psia		95.25
Critical Temperature (Cubic E	F	593.0848	
Critical Pressure (Cubic EOS)	psia	479.1639	
Dew Point Temperature	F	452.1604	
Bubble Point Temperature	F	107.7105	
Water Dew Point Temperature could not be calculated			
Stream Vapor Pressure	psia	88.6915	
Latent Heat of Vaporization (N	Btu/lb	103.1429	
Latent Heat of Vaporization (P	Btu/lb	324.9526	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	6065.23	
Heating Value (net)	Btu/SCF	5632.2	
Wobbe Number	Btu/SCF	2923.77	
Average Hydrogen Atoms		17.2137	
Average Carbon Atoms		7.8337	
Hydrogen to Carbon Ratio		2.1974	

Details for Stream 2

Stream 2 (Flash Gas)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Vapor Visc:	NBS81	Vapor ThC:	NBS81	Vapor Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Incipient Liquid 1 mol fra	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.021971	0.021971	0.00001649	0	0.834113	505.969
49 : CARBON DIOXIDE	0.046369	0.046369	0.000286	0	1.76039	61.6097
2 : METHANE	0.913967	0.913967	0.00179	0	34.6984	193.878
3 : ETHANE	0.62842	0.62842	0.00797	0	23.8577	29.9343
4 : PROPANE	0.534668	0.534668	0.026356	0	20.2984	7.70166
5 : ISOBUTANE	0.08965	0.08965	0.011336	0	3.40352	3.0023
6 : N-BUTANE	0.217561	0.217561	0.037404	0	8.25959	2.20818
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	1.48838
7 : ISOPENTANE	0.057116	0.057116	0.028151	0	2.1684	0.770284
8 : N-PENTANE	0.061759	0.061759	0.039177	0	2.34465	0.598482
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.360909
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.263381
52 : 2-METHYLPENTANE	0	0	0	0	0	0.236664
53 : 3-METHYLPENTANE	0	0	0	0	0	0.210746
10 : N-HEXANE	0.035766	0.035766	0.077003	0	1.35784	0.176335
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.154099
40 : BENZENE	0.001965	0.001965	0.004467	0	0.074591	0.166971
38 : CYCLOHEXANE	0.003994	0.003994	0.011305	0	0.151648	0.134139
79 : 2-METHYLHEXANE	0	0	0	0	0	0.065693
80 : 3-METHYLHEXANE	0	0	0	0	0	0.066054
11 : N-HEPTANE	0.011515	0.011515	0.082163	0	0.437172	0.053208
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.051298
41 : TOLUENE	0.002163	0.002163	0.019267	0	0.082116	0.042619
12 : N-OCTANE	0.003029	0.003029	0.070016	0	0.114983	0.016422
45 : ETHYL BENZENE	0.000197	0.000197	0.004687	0	0.007493	0.015986
43 : M-XYLENE	0.000981	0.000981	0.027872	0	0.037259	0.013368
42 : O-XYLENE	0	0	0	0	0	0.007514
13 : N-NONANE	0.000865	0.000865	0.06317	0	0.032827	0.005197
14 : N-DECANE	0.002081	0.002081	0.467563	0	0.078988	0.00162
62 : WATER	0	0	0	0	0	0.024719
Total	2.63404	2.63404	1	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Incipient Liquid 1 mass fra	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.615478	0.615478	0.000004	0	0.668823
49 : CARBON DIOXIDE	2.04066	2.04066	0.000108	0	2.21753
2 : METHANE	14.6628	14.6628	0.000248	0	15.9336
3 : ETHANE	18.8953	18.8953	0.002066	0	20.533
4 : PROPANE	23.5756	23.5756	0.01002	0	25.619
5 : ISOBUTANE	5.21045	5.21045	0.00568	0	5.66206
6 : N-BUTANE	12.6446	12.6446	0.01874	0	13.7406
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	4.12072	4.12072	0.01751	0	4.47787
8 : N-PENTANE	4.45566	4.45566	0.02437	0	4.84185
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	3.08202	3.08202	0.0572	0	3.34914
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.153462	0.153462	0.003008	0	0.166763
38 : CYCLOHEXANE	0.336158	0.336158	0.008202	0	0.365294
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	1.15381	1.15381	0.07097	0	1.25381
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.199282	0.199282	0.0153	0	0.216554
12 : N-OCTANE	0.345949	0.345949	0.06894	0	0.375934
45 : ETHYL BENZENE	0.020951	0.020951	0.004289	0	0.022767
43 : M-XYLENE	0.104187	0.104187	0.02551	0	0.113217
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.110894	0.110894	0.06984	0	0.120505
14 : N-DECANE	0.296014	0.296014	0.598	0	0.32167
62 : WATER	0	0	0	0	0
Total	92.024	92.024	1	0	100
	Total VOC	55.809757			

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	8.41816	8.41816	0	0	0.634113
49 : CARBON DIOXIDE	17.7665	17.7665	0	0	1.76039
2 : METHANE	350.188	350.188	0	0	34.6984
3 : ETHANE	240.78	240.78	0	0	23.8577
4 : PROPANE	204.859	204.859	0	0	20.2984
5 : ISOBUTANE	34.3495	34.3495	0	0	3.40352
6 : N-BUTANE	83.3587	83.3587	0	0	8.25959
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	21.8842	21.8842	0	0	2.1684
8 : N-PENTANE	23.663	23.663	0	0	2.34465
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	13.7038	13.7038	0	0	1.35784
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.752796	0.752796	0	0	0.074591
38 : CYCLOHEXANE	1.53049	1.53049	0	0	0.151648
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	4.41209	4.41209	0	0	0.437172
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.828741	0.828741	0	0	0.082116
12 : N-OCTANE	1.16045	1.16045	0	0	0.114983
45 : ETHYL BENZENE	0.075618	0.075618	0	0	0.007493
43 : M-XYLENE	0.376031	0.376031	0	0	0.037259
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.331299	0.331299	0	0	0.032827
14 : N-DECANE	0.79717	0.79717	0	0	0.078988
62 : WATER	0	0	0	0	0
Total	1009.24	1009.24	0	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	8.33756	8.33756	0	0	0.834113
49 : CARBON DIOXIDE	17.5964	17.5964	0	0	1.76039
2 : METHANE	346.835	346.835	0	0	34.6984
3 : ETHANE	238.475	238.475	0	0	23.8577
4 : PROPANE	202.897	202.897	0	0	20.2984
5 : ISOBUTANE	34.0206	34.0206	0	0	3.40352
6 : N-BUTANE	82.5606	82.5606	0	0	8.25959
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	21.6747	21.6747	0	0	2.1684
8 : N-PENTANE	23.4365	23.4365	0	0	2.34465
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	13.5726	13.5726	0	0	1.35784
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.745589	0.745589	0	0	0.074591
38 : CYCLOHEXANE	1.51583	1.51583	0	0	0.151648
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	4.36985	4.36985	0	0	0.437172
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.820807	0.820807	0	0	0.082116
12 : N-OCTANE	1.14934	1.14934	0	0	0.114983
45 : ETHYL BENZENE	0.074894	0.074894	0	0	0.007493
43 : M-XYLENE	0.372431	0.372431	0	0	0.037259
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.328127	0.328127	0	0	0.032827
14 : N-DECANE	0.789538	0.789538	0	0	0.078988
62 : WATER	0	0	0	0	0
Total	999.573	999.573	0	0	100

Properties

Temperature	F	70	
Pressure	psia	14.7	
Enthalpy	Btu/hr	1338.335	
Entropy	Btu/hr/R	11.88102	
Vapor Fraction		1	
		Total	Vapor
Flowrate	lbmol/hr	2.634	2.634
Flowrate	lb/hr	92.024	92.024
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		34.9365	34.9365
Enthalpy	Btu/lbmol	508.0927	508.0927
Enthalpy	Btu/lb	14.5433	14.5433
Entropy	Btu/lbmol/R	4.5106	4.5106
Entropy	Btu/lb/R	0.129108	0.129108
Cp	Btu/lbmol/R		14.5903
Cp	Btu/lb/R		0.4176
Cv	Btu/lbmol/R		12.534
Cv	Btu/lb/R		0.3588
Cp/Cv			1.1641
Density	lb/ft3		0.091182
Z-Factor			0.991021
Flowrate (T-P)	ft3/s		0.280343
Flowrate (STP)	MMSCFD		0.02399
Viscosity	cP		0.009578
Thermal Conductivity	Btu/hr/ft/R		0.012708
Critical Temperature (Cubic E	F	173.1526	
Critical Pressure (Cubic EOS)	psia	1347.8257	
Dew Point Temperature	F	70.0076	
Bubble Point Temperature	F	-259.4223	
Water Dew Point Temperature could not be calculated			
Stream Vapor Pressure	psia	1142.0302	
Vapor Sonic Velocity	ft/s	927.11	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	1964.1	
Heating Value (net)	Btu/SCF	1800.85	
Wobbe Number	Btu/SCF	1778.4	
Average Hydrogen Atoms		6.4895	
Average Carbon Atoms		2.2979	
Hydrogen to Carbon Ratio		2.8241	
Methane Number		41.29	
Motor Octane Number		98.76	

Details for Stream 3

Stream 3 (Condensate)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	NBS81	Liquid 2 ThC:	NBS81	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.000736	0	0.000736	0	0.001649	
49 : CARBON DIOXIDE	0.012764	0	0.012764	0	0.028573	
2 : METHANE	0.079949	0	0.079949	0	0.17897	
3 : ETHANE	0.356035	0	0.356035	0	0.797002	
4 : PROPANE	1.17737	0	1.17737	0	2.63559	
5 : ISOBUTANE	0.506416	0	0.506416	0	1.13364	
6 : N-BUTANE	1.67093	0	1.67093	0	3.74045	
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	
7 : ISOPENTANE	1.25754	0	1.25754	0	2.81506	
8 : N-PENTANE	1.75009	0	1.75009	0	3.91766	
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	
52 : 2-METHYLPENTANE	0	0	0	0	0	
53 : 3-METHYLPENTANE	0	0	0	0	0	
10 : N-HEXANE	3.43987	0	3.43987	0	7.7003	
37 : METHYLCYCLOPENTA	0	0	0	0	0	
40 : BENZENE	0.199562	0	0.199562	0	0.44673	
38 : CYCLOHEXANE	0.505027	0	0.505027	0	1.13053	
79 : 2-METHYLHEXANE	0	0	0	0	0	
80 : 3-METHYLHEXANE	0	0	0	0	0	
11 : N-HEPTANE	3.67037	0	3.67037	0	8.21631	
39 : METHYLCYCLOHEXAN	0	0	0	0	0	
41 : TOLUENE	0.860713	0	0.860713	0	1.92675	
12 : N-OCTANE	3.12774	0	3.12774	0	7.00156	
45 : ETHYL BENZENE	0.209372	0	0.209372	0	0.468689	
43 : M-XYLENE	1.24508	0	1.24508	0	2.78717	
42 : O-XYLENE	0	0	0	0	0	
13 : N-NONANE	2.82193	0	2.82193	0	6.31703	
14 : N-DECANE	21.7803	0	21.7803	0	48.7563	
62 : WATER	0	0	0	0	0	
Total	44.6718	0	44.6718	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.02063	0	0.02063	0	0.000398
49 : CARBON DIOXIDE	0.561737	0	0.561737	0	0.01084
2 : METHANE	1.28262	0	1.28262	0	0.024751
3 : ETHANE	10.7053	0	10.7053	0	0.206586
4 : PROPANE	51.9148	0	51.9148	0	1.00183
5 : ISOBUTANE	29.4329	0	29.4329	0	0.567984
6 : N-BUTANE	97.1143	0	97.1143	0	1.87407
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	90.7265	0	90.7265	0	1.7508
8 : N-PENTANE	126.262	0	126.262	0	2.43655
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	296.42	0	296.42	0	5.72019
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	15.5874	0	15.5874	0	0.300799
38 : CYCLOHEXANE	42.501	0	42.501	0	0.820168
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	367.764	0	367.764	0	7.09696
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	79.301	0	79.301	0	1.53032
12 : N-OCTANE	357.263	0	357.263	0	6.89431
45 : ETHYL BENZENE	22.2269	0	22.2269	0	0.428926
43 : M-XYLENE	132.178	0	132.178	0	2.55071
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	361.913	0	361.913	0	6.98405
14 : N-DECANE	3098.82	0	3098.82	0	59.7998
62 : WATER	0	0	0	0	0
Total	5182	0	5182	0	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.00193	0	0.00193	0	0.001649
49 : CARBON DIOXIOE	0.033444	0	0.033444	0	0.028573
2 : METHANE	0.209479	0	0.209479	0	0.17897
3 : ETHANE	0.93287	0	0.93287	0	0.797002
4 : PROPANE	3.08489	0	3.08489	0	2.63559
5 : ISOBUTANE	1.32689	0	1.32689	0	1.13364
6 : N-BUTANE	4.3781	0	4.3781	0	3.74045
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	3.29496	0	3.29496	0	2.81506
8 : N-PENTANE	4.58552	0	4.58552	0	3.91766
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	9.013	0	9.013	0	7.7003
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.522885	0	0.522885	0	0.44673
38 : CYCLOHEXANE	1.32325	0	1.32325	0	1.13053
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	9.61697	0	9.61697	0	8.21631
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	2.25521	0	2.25521	0	1.92675
12 : N-OCTANE	8.19517	0	8.19517	0	7.00158
45 : ETHYL BENZENE	0.548588	0	0.548588	0	0.468689
43 : M-XYLENE	3.26231	0	3.26231	0	2.78717
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	7.39392	0	7.39392	0	6.31703
14 : N-DECANE	57.068	0	57.068	0	48.7563
62 : WATER	0	0	0	0	0
Total	117.047	0	117.047	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.00041	0	0.00041	0	0.000353
49 : CARBON DIOXIDE	0.010957	0	0.010957	0	0.009425
2 : METHANE	0.068585	0	0.068585	0	0.05899
3 : ETHANE	0.481614	0	0.481614	0	0.41424
4 : PROPANE	1.64064	0	1.64064	0	1.41113
5 : ISOBUTANE	0.838372	0	0.838372	0	0.721091
6 : N-BUTANE	2.66615	0	2.66615	0	2.29318
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	2.32915	0	2.32915	0	2.00332
8 : N-PENTANE	3.20797	0	3.20797	0	2.7592
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	7.15792	0	7.15792	0	6.15659
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.282569	0	0.282569	0	0.24304
38 : CYCLOHEXANE	0.869828	0	0.869828	0	0.748147
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	8.56885	0	8.56885	0	7.37014
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	1.45851	0	1.45851	0	1.25448
12 : N-OCTANE	8.10312	0	8.10312	0	6.96956
45 : ETHYL BENZENE	0.408863	0	0.408863	0	0.351666
43 : M-XYLENE	2.43956	0	2.43956	0	2.09828
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	8.03931	0	8.03931	0	6.91468
14 : N-DECANE	67.692	0	67.692	0	58.2225
62 : WATER	0	0	0	0	0
Total	116.264	0	116.264	0	100

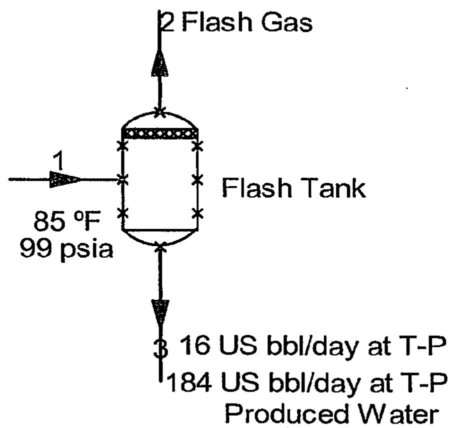
Properties

Temperature	F	70	
Pressure	psia	14.7	
Enthalpy	Btu/hr	-720718.1	
Entropy	Btu/hr/R	-801.2191	
Vapor Fraction		0	
		Total	Liquid 1
Flowrate	lbmol/hr	44.6718	44.6718
Flowrate	lb/hr	5181.9953	5181.9953
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		116.0014	116.0014
Enthalpy	Btu/lbmol	-16133.6115	-16133.6115
Enthalpy	Btu/lb	-139.0812	-139.0812
Entropy	Btu/lbmol/R	-17.9357	-17.9357
Entropy	Btu/lb/R	-0.154616	-0.154616
Cp	Btu/lbmol/R		57.4199
Cp	Btu/lb/R		0.495
Cv	Btu/lbmol/R		50.5021
Cv	Btu/lb/R		0.4354
Cp/Cv			1.137
Density	lb/ft3		44.2726
Z-Factor			0.006777
Flowrate (T-P)	gal/min		14.5939
Flowrate (STP)	gal/min		14.4953
Specific Gravity	GPA STP		0.714658
Viscosity	cP		0.515961
Thermal Conductivity	Btu/hr/ft/R		0.065866
Surface Tension	dyne/cm		21.2374
Reid Vapor Pressure (ASTM-A	psia		11.05
True Vapor Pressure at 100 F	psia		19.47
Critical Temperature (Cubic E	F	599.2774	
Critical Pressure (Cubic EOS)	psia	431.1843	
Dew Point Temperature	F	308.9403	
Bubble Point Temperature	F	69.9748	
Water Dew Point Temperature could not be calculated			
Stream Vapor Pressure	psia	14.7	
Latent Heat of Vaporization (N	Btu/lb	129.9117	
Latent Heat of Vaporization (P	Btu/lb	259.9742	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	6307.05	
Heating Value (net)	Btu/SCF	5858.11	
Wobbe Number	Btu/SCF	2964.64	
Average Hydrogen Atoms		17.8461	
Average Carbon Atoms		8.1601	
Hydrogen to Carbon Ratio		2.187	

DESIGN II for Windows

Simulation Result: SOLUTION REACHED

Problem:
Project:
Task:
By:
At: 26-Apr-12 11:04 AM



Details for Stream 1

Stream 1 (Strm 1)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	STEAM	Liquid 2 ThC:	STEAM	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.000722	0	0.000462	0.00026	0.00048	76.3973
49 : CARBON DIOXIDE	0.001879	0	0.000385	0.001494	0.00125	10.619
2 : METHANE	0.031586	0	0.021934	0.009652	0.02101	30.7589
3 : ETHANE	0.031285	0	0.028974	0.002312	0.02081	5.34955
4 : PROPANE	0.054407	0	0.053051	0.001356	0.03619	1.50467
5 : ISOBUTANE	0.018943	0	0.018877	0.00006534	0.0126	0.624209
6 : N-BUTANE	0.060015	0	0.059859	0.000156	0.03992	0.468635
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	0.288569
7 : ISOPENTANE	0.041779	0	0.041738	0.00004069	0.02779	0.175808
8 : N-PENTANE	0.057579	0	0.057535	0.00004433	0.0383	0.138973
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.07402
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.054639
52 : 2-METHYLPENTANE	0	0	0	0	0	0.049715
53 : 3-METHYLPENTANE	0	0	0	0	0	0.044482
10 : N-HEXANE	0.110453	0	0.110426	0.00002716	0.07347	0.044351
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.032828
40 : BENZENE	0.006404	0	0.006403	0.000001453	0.00426	0.040916
38 : CYCLOHEXANE	0.016176	0	0.016173	0.000003006	0.01076	0.033541
79 : 2-METHYLHEXANE	0	0	0	0	0	0.014751
80 : 3-METHYLHEXANE	0	0	0	0	0	0.014682
11 : N-HEPTANE	0.117008	0	0.116998	0.000009465	0.07783	0.01459
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.011357
41 : TOLUENE	0.027422	0	0.02742	0.000001735	0.01824	0.011414
12 : N-OCTANE	0.099493	0	0.099491	0.000002694	0.06618	0.004863
45 : ETHYL BENZENE	0.00666	0	0.00666	1.702E-07	0.00443	0.00461
43 : M-XYLENE	0.039599	0	0.039598	8.517E-07	0.02634	0.003879
42 : O-XYLENE	0	0	0	0	0	0.001809
13 : N-NONANE	0.089706	0	0.089706	8.339E-07	0.05967	0.001677
14 : N-DECANE	0.692229	0	0.692227	0.000002183	0.46045	0.000569
62 : WATER	148.834	0	0.001415	148.833	99	6.53687
Total	150.337	0	1.48933	148.848	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.020215	0	0.012928	0.007287	0.00071
49 : CARBON DIOXIDE	0.082702	0	0.016932	0.06577	0.002903
2 : METHANE	0.506732	0	0.351879	0.154853	0.017787
3 : ETHANE	0.940684	0	0.871177	0.069507	0.033019
4 : PROPANE	2.39903	0	2.33922	0.059808	0.084209
5 : ISOBUTANE	1.10094	0	1.09714	0.003797	0.038644
6 : N-BUTANE	3.48806	0	3.47902	0.00904	0.122435
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	3.01417	0	3.01124	0.002935	0.105801
8 : N-PENTANE	4.15411	0	4.15091	0.003199	0.145815
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	9.51795	0	9.51561	0.00234	0.334092
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.500233	0	0.50012	0.000113	0.017559
38 : CYCLOHEXANE	1.36133	0	1.36108	0.000253	0.047785
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	11.7239	0	11.723	0.000948	0.411525
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	2.52646	0	2.5263	0.00016	0.088682
12 : N-OCTANE	11.3645	0	11.3642	0.000308	0.398909
45 : ETHYL BENZENE	0.70702	0	0.707002	0.00001807	0.024817
43 : M-XYLENE	4.20382	0	4.20373	0.00009042	0.147559
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	11.5048	0	11.5047	0.000107	0.403834
14 : N-DECANE	98.4876	0	98.4873	0.000311	3.45704
62 : WATER	2681.3	0	0.025495	2681.27	94.1169
Total	2848.9	0	167.249	2681.65	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.001267	0	0.001194	0.00007392	0.002746
49 : CARBON DIOXIDE	0.00142	0	0.000995	0.000425	0.003076
2 : METHANE	0.059468	0	0.056725	0.002743	0.128856
3 : ETHANE	0.075589	0	0.074932	0.000657	0.163788
4 : PROPANE	0.137586	0	0.137201	0.000385	0.298126
5 : ISOBUTANE	0.048839	0	0.04882	0.00001857	0.105826
6 : N-BUTANE	0.154853	0	0.154809	0.0000442	0.33554
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.107955	0	0.107944	0.00001156	0.233921
8 : N-PENTANE	0.14881	0	0.148798	0.0000126	0.322446
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.285592	0	0.285585	0.000007717	0.61883
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.01656	0	0.016559	4.128E-07	0.035882
38 : CYCLOHEXANE	0.041828	0	0.041828	8.547E-07	0.090635
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.302585	0	0.302582	0.00000269	0.65565
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.070914	0	0.070914	4.931E-07	0.153659
12 : N-OCTANE	0.257305	0	0.257304	7.655E-07	0.557536
45 : ETHYL BENZENE	0.017224	0	0.017224	4.837E-08	0.037321
43 : M-XYLENE	0.102409	0	0.102409	0.000000242	0.221903
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.231998	0	0.231998	0.000000237	0.5027
14 : N-DECANE	1.79025	0	1.79025	6.203E-07	3.87916
62 : WATER	42.2979	0	0.00366	42.2943	91.6524
Total	46.1504	0	3.85172	42.2986	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.000402	0	0.000257	0.000145	0.000859
49 : CARBON DIOXIDE	0.001613	0	0.00033	0.001283	0.003448
2 : METHANE	0.027096	0	0.018816	0.00828	0.057912
3 : ETHANE	0.04232	0	0.039193	0.003127	0.09045
4 : PROPANE	0.075816	0	0.073926	0.00189	0.16204
5 : ISOBUTANE	0.031359	0	0.031251	0.000108	0.067024
6 : N-BUTANE	0.09576	0	0.095512	0.000248	0.204667
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.07738	0	0.077305	0.00007536	0.165384
8 : N-PENTANE	0.105544	0	0.105463	0.00008127	0.225579
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.229838	0	0.229782	0.00005651	0.491232
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.009068	0	0.009068	0.000002057	0.019381
38 : CYCLOHEXANE	0.027861	0	0.027856	0.00000518	0.059547
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.273166	0	0.273144	0.0000221	0.583835
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.046467	0	0.046464	0.00000294	0.099313
12 : N-OCTANE	0.25776	0	0.257753	0.000006979	0.550909
45 : ETHYL BENZENE	0.013006	0	0.013005	3.324E-07	0.027797
43 : M-XYLENE	0.077588	0	0.077587	0.000001669	0.165829
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.255561	0	0.255559	0.000002376	0.546209
14 : N-DECANE	2.15141	0	2.1514	0.000006784	4.59818
62 : WATER	42.9892	0	0.000409	42.9888	91.8804
Total	46.7882	0	3.78408	43.0041	100

Properties

Temperature	F	85		
Pressure	psia	98.696		
Enthalpy	Btu/hr	-2761972		
Entropy	Btu/hr/R	-4397.578		
Vapor Fraction		0		
		Total	Liquid 1	Liquid 2
Flowrate	lbmol/hr	150.3375	1.4893	148.8481
Flowrate	lb/hr	2848.9017	167.249	2681.6527
Mole Fraction		1	0.009907	0.990093
Mass Fraction		1	0.058706	0.941294
Molecular Weight		18.95	112.2982	18.016
Enthalpy	Btu/lbmol	-18371.8148	-14752.178	-18408.0317
Enthalpy	Btu/lb	-969.4666	-131.3661	-1021.7584
Entropy	Btu/lbmol/R	-29.2514	-15.8869	-29.3851
Entropy	Btu/lb/R	-1.5436	-0.141471	-1.6311
Cp	Btu/lbmol/R		56.9172	17.9928
Cp	Btu/lb/R		0.5068	0.9987
Cv	Btu/lbmol/R		49.8785	17.7287
Cv	Btu/lb/R		0.4442	0.984
Cp/Cv			1.1411	1.0149
Density	lb/ft3		43.4219	63.3981
Z-Factor			0.043675	0.004799
Flowrate (T-P)	gal/min		0.480246	5.2739
Flowrate (STP)	gal/min		0.471781	5.3616
Specific Gravity	GPA STP		0.706682	0.999863
Viscosity	cP		0.535142	0.807243
Thermal Conductivity	Btu/hr/ft/R		0.067989	0.355244
Surface Tension	dyne/cm		19.4988	71.2853
Reid Vapor Pressure (ASTM-A)		unconverged		
True Vapor Pressure at 100 F	psia		73.11	
Critical Temperature (Cubic E	F	695.2244		
Critical Pressure (Cubic EOS)	psia	3254.5678		
Dew Point Temperature	F	322.9413		
Bubble Point Temperature	F	152.3111		
Water Dew Point Temperature could not be calculated				
Liquid 2 Freezing Point	F	31.9059		
Stream Vapor Pressure	psia	66.7783		
Latent Heat of Vaporization (N	Btu/lb	857.1977		
Latent Heat of Vaporization (P	Btu/lb	1091.036		
CO2 Freeze Up		No		
Heating Value (gross)	Btu/SCF	60.65		
Heating Value (net)	Btu/SCF	56.32		
Wobbe Number	Btu/SCF	74.37		
Average Hydrogen Atoms		2.1521		
Average Carbon Atoms		0.0783		
Hydrogen to Carbon Ratio		27.4733		

Details for Stream 2

Stream 2 (Flash Gas)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Vapor Visc:	NBS81	Vapor ThC:	NBS81	Vapor Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Incipient Liquid 1 mol fra	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.000683	0.000683	0.00001636	0	0.827733	506.086
49 : CARBON DIOXIDE	0.000754	0.000754	0.000148	0	0.913919	61.6028
2 : METHANE	0.027929	0.027929	0.001745	0	33.839	193.912
3 : ETHANE	0.019292	0.019292	0.007808	0	23.3751	29.9379
4 : PROPANE	0.016523	0.016523	0.025989	0	20.0193	7.70283
5 : ISOBUTANE	0.00281	0.00281	0.011335	0	3.40413	3.00307
6 : N-BUTANE	0.006818	0.006818	0.037403	0	8.26093	2.20861
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	1.48838
7 : ISOPENTANE	0.00179	0.00179	0.028151	0	2.16904	0.770489
8 : N-PENTANE	0.001936	0.001936	0.039178	0	2.34525	0.59861
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.360909
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.263381
52 : 2-METHYLPENTANE	0	0	0	0	0	0.236664
53 : 3-METHYLPENTANE	0	0	0	0	0	0.210746
10 : N-HEXANE	0.001121	0.001121	0.077008	0	1.3584	0.176398
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.154099
40 : BENZENE	0.00006156	0.00006156	0.004468	0	0.074586	0.166949
38 : CYCLOHEXANE	0.000125	0.000125	0.011306	0	0.151666	0.134146
79 : 2-METHYLHEXANE	0	0	0	0	0	0.065693
80 : 3-METHYLHEXANE	0	0	0	0	0	0.066054
11 : N-HEPTANE	0.000361	0.000361	0.082169	0	0.43739	0.053231
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.051298
41 : TOLUENE	0.00006778	0.00006778	0.019269	0	0.082123	0.04262
12 : N-OCTANE	0.00009496	0.00009496	0.070021	0	0.115056	0.016432
45 : ETHYL BENZENE	0.000006185	0.000006185	0.004687	0	0.007494	0.015987
43 : M-XYLENE	0.00003076	0.00003076	0.027874	0	0.037266	0.01337
42 : O-XYLENE	0	0	0	0	0	0.007514
13 : N-NONANE	0.00002711	0.00002711	0.063175	0	0.032852	0.0052
14 : N-DECANE	0.00006525	0.00006525	0.487599	0	0.079056	0.001621
62 : WATER	0.002038	0.002038	0.00065	0	2.46969	37.9843
Total	0.082534	0.082534	1	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Incipient Liquid 1 mass fra	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.019138	0.019138	0.000004	0	0.670084
49 : CARBON DIOXIDE	0.033195	0.033195	0.000056	0	1.16231
2 : METHANE	0.448058	0.448058	0.000241	0	15.6883
3 : ETHANE	0.580082	0.580082	0.002024	0	20.311
4 : PROPANE	0.728548	0.728548	0.00988	0	25.5094
5 : ISOBUTANE	0.163291	0.163291	0.00568	0	5.71748
6 : N-BUTANE	0.396264	0.396264	0.01874	0	13.8748
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.129155	0.129155	0.01751	0	4.52223
8 : N-PENTANE	0.139647	0.139647	0.02437	0	4.88961
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.096611	0.096611	0.05721	0	3.38273
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.004808	0.004808	0.003008	0	0.168355
38 : CYCLOHEXANE	0.010534	0.010534	0.008203	0	0.368848
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.036171	0.036171	0.07098	0	1.26649
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.006245	0.006245	0.01531	0	0.218654
12 : N-OCTANE	0.010847	0.010847	0.06895	0	0.379788
45 : ETHYL BENZENE	0.000657	0.000657	0.00429	0	0.022989
43 : M-XYLENE	0.003265	0.003265	0.02551	0	0.114327
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.003477	0.003477	0.06985	0	0.121758
14 : N-DECANE	0.009283	0.009283	0.5981	0	0.325042
62 : WATER	0.036721	0.036721	0.000101	0	1.28575
Total	2.856	2.856	1	0	100
	Total VOC	1.775524			

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.261695	0.261695	0	0	0.827733
49 : CARBON DIOXIDE	0.288944	0.288944	0	0	0.913919
2 : METHANE	10.6985	10.6985	0	0	33.839
3 : ETHANE	7.39026	7.39026	0	0	23.3751
4 : PROPANE	6.32927	6.32927	0	0	20.0193
5 : ISOBUTANE	1.07625	1.07625	0	0	3.40413
6 : N-BUTANE	2.61177	2.61177	0	0	8.26093
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.685761	0.685761	0	0	2.16904
8 : N-PENTANE	0.741471	0.741471	0	0	2.34525
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.429471	0.429471	0	0	1.3584
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.023581	0.023581	0	0	0.074586
38 : CYCLOHEXANE	0.047951	0.047951	0	0	0.151666
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.138285	0.138285	0	0	0.43739
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.025964	0.025964	0	0	0.082123
12 : N-OCTANE	0.036376	0.036376	0	0	0.115056
45 : ETHYL BENZENE	0.002369	0.002369	0	0	0.007494
43 : M-XYLENE	0.011782	0.011782	0	0	0.037266
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.010387	0.010387	0	0	0.032852
14 : N-DECANE	0.024994	0.024994	0	0	0.079056
62 : WATER	0.780813	0.780813	0	0	2.46969
Total	31.6159	31.6159	0	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.259247	0.259247	0	0	0.827733
49 : CARBON DIOXIDE	0.28624	0.28624	0	0	0.913919
2 : METHANE	10.5984	10.5984	0	0	33.839
3 : ETHANE	7.32111	7.32111	0	0	23.3751
4 : PROPANE	6.27006	6.27006	0	0	20.0193
5 : ISOBUTANE	1.06618	1.06618	0	0	3.40413
6 : N-BUTANE	2.58733	2.58733	0	0	8.26093
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.679345	0.679345	0	0	2.16904
8 : N-PENTANE	0.734534	0.734534	0	0	2.34525
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.425453	0.425453	0	0	1.3584
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.02336	0.02336	0	0	0.074586
38 : CYCLOHEXANE	0.047502	0.047502	0	0	0.151666
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.136991	0.136991	0	0	0.43739
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.025721	0.025721	0	0	0.082123
12 : N-OCTANE	0.036036	0.036036	0	0	0.115056
45 : ETHYL BENZENE	0.002347	0.002347	0	0	0.007494
43 : M-XYLENE	0.011672	0.011672	0	0	0.037266
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.010289	0.010289	0	0	0.032852
14 : N-DECANE	0.02476	0.02476	0	0	0.079056
62 : WATER	0.773508	0.773508	0	0	2.46969
Total	31.3201	31.3201	0	0	100

Properties

Temperature	F	70	
Pressure	psia	14.7	
Enthalpy	Btu/hr	41.70611	
Entropy	Btu/hr/R	0.3814897	
Vapor Fraction		1	
		Total	Vapor
Flowrate	lbmol/hr	0.082534	0.082534
Flowrate	lb/hr	2.856	2.856
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		34.6041	34.6041
Enthalpy	Btu/lbmol	505.323	505.323
Enthalpy	Btu/lb	14.603	14.603
Entropy	Btu/lbmol/R	4.6222	4.6222
Entropy	Btu/lb/R	0.133575	0.133575
Cp	Btu/lbmol/R		14.5338
Cp	Btu/lb/R		0.42
Cv	Btu/lbmol/R		12.4762
Cv	Btu/lb/R		0.3605
Cp/Cv			1.1649
Density	lb/ft3		0.090334
Z-Factor			0.990803
Flowrate (T-P)	ft3/s		0.008782
Flowrate (STP)	MMSCFD		0.0007517
Viscosity	cP		0.009488
Thermal Conductivity	Btu/hr/ft/R		0.012672
Critical Temperature (Cubic E	F	183.9023	
Critical Pressure (Cubic EOS)	psia	1379.435	
Dew Point Temperature	F	69.9999	
Bubble Point Temperature	F	-259.9682	
Water Dew Point	F	71.5716	
Stream Vapor Pressure	psia	1136.0205	
Vapor Sonic Velocity	ft/s	931.68	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	1940.02	
Heating Value (net)	Btu/SCF	1778.92	
Wobbe Number	Btu/SCF	1764.79	
Average Hydrogen Atoms		6.4538	
Average Carbon Atoms		2.263	
Hydrogen to Carbon Ratio		2.8518	
Methane Number		41.76	
Motor Octane Number		99.05	

Details for Stream 3

Stream 3 (Produced Water)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	STEAM	Liquid 2 ThC:	STEAM	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.00003846	0	0.00002322	0.00001524	0.0000256	
49 : CARBON DIOXIDE	0.001125	0	0.000211	0.000914	0.000749	
2 : METHANE	0.003657	0	0.002477	0.00118	0.002434	
3 : ETHANE	0.011993	0	0.011084	0.000909	0.007982	
4 : PROPANE	0.037885	0	0.036893	0.000992	0.025213	
5 : ISOBUTANE	0.016133	0	0.016091	0.00004187	0.010737	
6 : N-BUTANE	0.053197	0	0.053095	0.000102	0.035404	
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	
7 : ISOPENTANE	0.039989	0	0.039962	0.00002668	0.026614	
8 : N-PENTANE	0.055644	0	0.055615	0.00002884	0.037033	
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	
52 : 2-METHYLPENTANE	0	0	0	0	0	
53 : 3-METHYLPENTANE	0	0	0	0	0	
10 : N-HEXANE	0.109332	0	0.109315	0.00001671	0.072764	
37 : METHYLCYCLOPENTA	0	0	0	0	0	
40 : BENZENE	0.006343	0	0.006342	9.173E-07	0.004221	
38 : CYCLOHEXANE	0.016051	0	0.016049	0.000001865	0.010683	
79 : 2-METHYLHEXANE	0	0	0	0	0	
80 : 3-METHYLHEXANE	0	0	0	0	0	
11 : N-HEPTANE	0.116647	0	0.116641	0.000005379	0.077633	
39 : METHYLCYCLOHEXAN	0	0	0	0	0	
41 : TOLUENE	0.027354	0	0.027353	0.00000101	0.018205	
12 : N-OCTANE	0.099398	0	0.099397	0.000001415	0.066153	
45 : ETHYL BENZENE	0.006654	0	0.006654	9.216E-08	0.004428	
43 : M-XYLENE	0.039568	0	0.039568	4.583E-07	0.026334	
42 : O-XYLENE	0	0	0	0	0	
13 : N-NONANE	0.089679	0	0.089679	0.000000404	0.059685	
14 : N-DECANE	0.692164	0	0.692163	9.723E-07	0.46066	
62 : WATER	148.832	0	0.000923	148.831	99.053	
Total	150.255	0	1.41953	148.835	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.001077	0	0.00065	0.000427	0.00003786
49 : CARBON DIOXIDE	0.049507	0	0.009268	0.040239	0.001739
2 : METHANE	0.058675	0	0.039741	0.018933	0.002062
3 : ETHANE	0.360603	0	0.33326	0.027343	0.01267
4 : PROPANE	1.67048	0	1.62676	0.043722	0.058695
5 : ISOBUTANE	0.937649	0	0.935215	0.002433	0.032946
6 : N-BUTANE	3.09179	0	3.08589	0.005905	0.108635
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISDPENTANE	2.88502	0	2.88309	0.001925	0.101369
8 : N-PENTANE	4.01447	0	4.01239	0.002081	0.141054
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	9.42134	0	9.4199	0.00144	0.331033
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.495425	0	0.495353	0.00007165	0.017407
38 : CYCLOHEXANE	1.3508	0	1.35064	0.000157	0.047462
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	11.6878	0	11.6872	0.000539	0.410667
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	2.52021	0	2.52012	0.00009305	0.088551
12 : N-OCTANE	11.3537	0	11.3535	0.000162	0.398928
45 : ETHYL BENZENE	0.706364	0	0.706354	0.000009783	0.024819
43 : M-XYLENE	4.20055	0	4.20051	0.00004865	0.147593
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	11.5014	0	11.5013	0.00005182	0.404117
14 : N-DECANE	98.4783	0	98.4782	0.000138	3.46018
62 : WATER	2681.26	0	0.016627	2681.24	94.21
Total	2846.05	0	164.656	2681.39	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.00006522	0	0.00006081	0.000004408	0.000139
49 : CARBON DIOXIDE	0.000816	0	0.000552	0.000264	0.001745
2 : METHANE	0.00683	0	0.006489	0.000341	0.014608
3 : ETHANE	0.029295	0	0.029032	0.000263	0.062656
4 : PROPANE	0.096924	0	0.096637	0.000287	0.207299
5 : ISOBUTANE	0.042161	0	0.042149	0.00001211	0.090173
6 : N-BUTANE	0.139106	0	0.139077	0.00002938	0.297517
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.104684	0	0.104676	0.000007714	0.223895
8 : N-PENTANE	0.145685	0	0.145677	0.00000834	0.311589
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.286344	0	0.286339	0.000004831	0.612426
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.016612	0	0.016612	2.652E-07	0.03553
38 : CYCLOHEXANE	0.04204	0	0.042039	5.394E-07	0.089914
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.30553	0	0.305529	0.000001555	0.653463
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.071648	0	0.071648	0.000000292	0.153239
12 : N-OCTANE	0.26036	0	0.260359	4.092E-07	0.556853
45 : ETHYL BENZENE	0.017429	0	0.017429	2.665E-08	0.037276
43 : M-XYLENE	0.103643	0	0.103643	1.325E-07	0.22167
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.234904	0	0.234904	1.168E-07	0.502408
14 : N-DECANE	1.81304	0	1.81304	2.811E-07	3.8777
62 : WATER	43.0385	0	0.002418	43.0361	92.0499
Total	46.7556	0	3.71831	43.0373	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.00002141	0	0.00001292	0.000008487	0.00004586
49 : CARBON DIOXIDE	0.000966	0	0.000181	0.000785	0.002068
2 : METHANE	0.003137	0	0.002125	0.001012	0.00672
3 : ETHANE	0.016223	0	0.014993	0.00123	0.034748
4 : PROPANE	0.052792	0	0.05141	0.001382	0.113076
5 : ISOBUTANE	0.026708	0	0.026639	0.00006931	0.057207
6 : N-BUTANE	0.084881	0	0.084719	0.000162	0.181809
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.074065	0	0.074015	0.00004941	0.158641
8 : N-PENTANE	0.101996	0	0.101943	0.00005287	0.218469
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.227505	0	0.227471	0.00003476	0.4873
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.008981	0	0.00898	0.000001299	0.019237
38 : CYCLOHEXANE	0.027646	0	0.027642	0.000003213	0.059215
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.272323	0	0.27231	0.00001256	0.583296
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.046352	0	0.04635	0.000001711	0.099282
12 : N-OCTANE	0.257514	0	0.257511	0.000003666	0.551577
45 : ETHYL BENZENE	0.012994	0	0.012993	0.00000018	0.027831
43 : M-XYLENE	0.077528	0	0.077527	0.000000898	0.16606
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.255484	0	0.255483	0.000001151	0.547229
14 : N-DECANE	2.1512	0	2.1512	0.000003022	4.60772
62 : WATER	42.9886	0	0.000267	42.9883	92.0785
Total	46.6869	0	3.69377	42.9931	100

Properties

Temperature	F	70		
Pressure	psia	14.7		
Enthalpy	Btu/hr	-2803701		
Entropy	Btu/hr/R	-4474.077		
Vapor Fraction		0		
		Total	Liquid 1	Liquid 2
Flowrate	lbmol/hr	150.2549	1.4195	148.8354
Flowrate	lb/hr	2846.0457	164.656	2681.3897
Mole Fraction		1	0.009448	0.990552
Mass Fraction		1	0.057854	0.942146
Molecular Weight		18.9414	115.993	18.0158
Enthalpy	Btu/lbmol	-18659.6272	-16137.915	-18683.6783
Enthalpy	Btu/lb	-985.1216	-139.1284	-1037.0714
Entropy	Btu/lbmol/R	-29.7766	-17.9358	-29.8895
Entropy	Btu/lb/R	-1.572	-0.154628	-1.6591
Cp	Btu/lbmol/R		57.5519	17.9991
Cp	Btu/lb/R		0.4962	0.9991
Cv	Btu/lbmol/R		50.6338	17.8638
Cv	Btu/lb/R		0.4365	0.9916
Cp/Cv			1.1366	1.0076
Density	lb/ft3		44.2825	62.3039
Z-Factor			0.006775	0.0007479
Flowrate (T-P)	gal/min		0.463611	5.366
Flowrate (STP)	gal/min		0.460522	5.3602
Specific Gravity	GPA STP		0.714752	1
Viscosity	cP		0.555862	0.975963
Thermal Conductivity	Btu/hr/ft/R		0.065905	0.346918
Surface Tension	dyne/cm		21.2845	72.5713
Reid Vapor Pressure (ASTM-A)		unconverged		
True Vapor Pressure at 100 F	psia		20.13	
Critical Temperature (Cubic E	F	695.4634		
Critical Pressure (Cubic EOS)	psia	3249.6418		
Dew Point Temperature	F	211.5525		
Bubble Point Temperature	F	70.2894		
Water Dew Point Temperature could not be calculated				
Liquid 2 Freezing Point	F	31.986		
Stream Vapor Pressure	psia	14.7		
Latent Heat of Vaporization (N	Btu/lb	925.8833		
Latent Heat of Vaporization (P	Btu/lb	1063.375		
CO2 Freeze Up		No		
Heating Value (gross)	Btu/SCF	59.62		
Heating Value (net)	Btu/SCF	55.37		
Wobbe Number	Btu/SCF	73.12		
Average Hydrogen Atoms		2.1498		
Average Carbon Atoms		0.0771		
Hydrogen to Carbon Ratio		27.8701		

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	TK-AF
City:	Corpus Christi
State:	Texas
Company:	
Type of Tank:	Horizontal Tank
Description:	300 Gal Anitfreeze Tank
Tank Dimensions	
Shell Length (ft):	6.00
Diameter (ft):	3.00
Volume (gallons):	300.00
Turnovers:	12.00
Net Throughput(gal/yr):	3,600.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Corpus Christi, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

TK-AF - Horizontal Tank
Corpus Christi, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl alcohol	All	73.50	68.36	78.64	71.57	2.1786	1.8675	2.5329	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

TK-AF - Horizontal Tank
Corpus Christi, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	8.9090
Vapor Space Volume (cu ft):	27.0137
Vapor Density (lb/cu ft):	0.0122
Vapor Space Expansion Factor:	0.0869
Vented Vapor Saturation Factor:	0.8524
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	27.0137
Tank Diameter (ft):	3.0000
Effective Diameter (ft):	4.7885
Vapor Space Outage (ft):	1.5000
Tank Shell Length (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0122
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.1786
Daily Avg. Liquid Surface Temp. (deg. R):	533.1716
Daily Average Ambient Temp. (deg. F):	71.5458
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	531.2358
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,447.9410
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0869
Daily Vapor Temperature Range (deg. R):	20.5542
Daily Vapor Pressure Range (psia):	0.6654
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.1788
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	1.8675
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	2.5329
Daily Avg. Liquid Surface Temp. (deg R):	533.1716
Daily Min. Liquid Surface Temp. (deg R):	528.0331
Daily Max. Liquid Surface Temp. (deg R):	538.3102
Daily Ambient Temp. Range (deg. R):	18.9750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.8524
Vapor Pressure at Daily Avarage Liquid: Surface Temperature (psia):	2.1786
Vapor Space Outage (ft):	1.5000
Working Losses (lb):	5.9832
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure et Daily Average Liquid Surface Temperature (psia):	2.1786
Annual Net Throughput (gal/yr.):	3,600.0000
Annual Turnovers:	12.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	3.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	14.8921

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-AF - Horizontal Tank
Corpus Christi, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	5.98	8.91	14.89

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	TK-LO
City:	Corpus Christi
State:	Texas
Company:	
Type of Tank:	Horizontal Tank
Description:	500 Gal Lube Oil Tank
Tank Dimensions	
Shell Length (ft):	6.00
Diameter (ft):	4.00
Volume (gallons):	500.00
Turnovers:	12.00
Net Throughput(gal/yr):	6,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Corpus Christi, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

TK-LO - Horizontal Tank
Corpus Christi, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
LUBE OIL	All	73.50	68.36	78.64	71.57	0.0001	0.0001	0.0001	190.0000			387.00	Option 1: VP70 = .0001 VP80 = .0001

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

TK-LO - Horizontal Tank
Corpus Christi, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	0.0020
Vapor Space Volume (cu ft):	48.0243
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0345
Vented Vapor Saturation Factor:	1.0000
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	48.0243
Tank Diameter (ft):	4.0000
Effective Diameter (ft):	5.5293
Vapor Space Dutage (ft):	2.0000
Tank Shell Length (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	190.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0001
Daily Avg. Liquid Surface Temp. (deg. R):	533.1716
Daily Average Ambient Temp. (deg. F):	71.5458
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	531.2358
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,447.9410
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0345
Daily Vapor Temperature Range (deg. R):	20.5542
Daily Vapor Pressure Range (psia):	0.0000
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperatura (psia):	0.0001
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0001
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0001
Daily Avg. Liquid Surface Temp. (deg R):	533.1716
Daily Min. Liquid Surface Temp. (deg R):	528.0331
Daily Max. Liquid Surface Temp. (deg R):	538.3102
Daily Ambient Temp. Range (deg. R):	18.9750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	1.0000
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0001
Vapor Space Dutage (ft):	2.0000
Working Losses (lb):	0.0027
Vapor Molecular Weight (lb/lb-mole):	190.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0001
Annual Net Throughput (gal/yr.):	6,000.0000
Annual Turnovers:	12.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	4.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	0.0047

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

TK-LO - Horizontal Tank
Corpus Christi, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
LUBE OIL	0.00	0.00	0.00

ATTACHMENT 4
REGULATORY APPLICABILITY

OIL AND GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB – BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

ATTACHMENT 4
REGULATORY APPLICABILITY

Burlington Resources Oil & Gas Company LP (Burlington) is submitting this Oil and Gas Standard Permit (SP) Registration to authorize Sugarloaf Central facility 1 (the Site). The Site will include two (2) compressor engines and associated blowdown and starter vent events, one (1) glycol dehydration unit, nine (9) controlled atmospheric condensate storage tanks and associated loading, ten (10) controlled atmospheric produced water storage tanks and associated loading, one (1) controlled atmospheric slop storage tank and associated loading, one (1) vapor recovery unit (VRU) combustion control device, three (3) flare combustion control devices, atmospheric chemical and lube oil storage tanks and piping and fugitive components. The following paragraphs address the Site's compliance with each of the applicable SP requirements. A copy of this SP is located in Attachment 6 of this SP registration.

Non-Rule Air Quality Standard Permit for Oil and Gas Handling and Production Facilities, effective February 27, 2011.

SP (a)(1)

This rule states that the requirements in paragraphs (a)-(k) of this standard permit are applicable to projects located in the Barnett Shale (Archer, Bosque, Clay, Comanche, Cooke, Coryell, Dallas, Denton, Eastland, Ellis, Erath, Hill, Hood, Jack, Johnson, Montague, Palo Pinto, Parker, Shackelford, Stephens, Somervell, Tarrant, and Wise Counties) on or after April 1, 2011. For all other projects and dependent facilities, 30 TAC 116.620 is applicable.

The Site is located in Live Oak County and is therefore not required to meet this SP. However, Burlington has opted to meet the Non-Rule Air Quality Standard Permit voluntarily.

SP (a)(2)

This rule states that only one Air Quality Standard Permit for Oil and Gas Handling and Production Facilities for an oil and gas site (OGS) may be registered for a combination of dependent facilities, and may not be used if operationally dependent facilities are authorized by the permit by rule in 30 TAC 106.352 or 116.111. Existing authorized facilities which are not changing certified character or quantity of emissions must only meet subsections (i) and (k) of this standard permit.

All facilities at the Site are included in this SP registration, in accordance with this rule.

SP (a)(3)

This rule does not relieve the owner or operator from complying with any other applicable provision of the Texas Health and Safety Code, Texas Water Code, rules of the Texas Commission on Environmental Quality (TCEQ), or any additional local, state, or federal regulations.

Burlington will comply with the applicable provisions of these regulations.

SP (a)(4)

This rule states that emissions from upsets, emergencies, or malfunctions are not authorized by this standard permit. This standard permit does not regulate methane, ethane, or carbon dioxide.

This SP registration does not include emissions from upset, emergency, or malfunction events. If any such emission events occur, Burlington Resources will manage them in accordance with 30 TAC Chapter 101.

SP (b)(1)-(8)

These rules state the definitions and scope of a Facility, Receptors, and OGS. The rules also state that the definitions of 30 TAC §122.10 relating to the Federal Operating Permits program apply. A project is defined as any new facility or group of operationally dependent facilities at an OGS or physical or operational changes to existing authorized facilities which increase the potential to emit over previously certified limits and must meet all requirements of this standard permit prior to construction or implementation of changes, including an impacts analysis as specified in paragraph (k) of this SP.

This permit application was completed according to the definitions and scope laid out in these rules.

SP (c)(1)

This rule states that existing OGS which are authorized by previous versions of this Standard Permit require registration unless the Project can meet exceptions listed in this requirement.

This Site was not authorized under a previous SP; therefore, this rule does not apply.

SP (c)(2)(A)

This rule states that new, changed, or replacement facilities shall not exceed the thresholds for major source or major modification as defined in 30 TAC §116.12 (Nonattainment and Prevention of Significant Deterioration Review Definitions), and in Federal Clean Air Act, §112(g) or §112(j);

The Site is located in Live Oak County which is an attainment county. The Site is a new project and emission totals for the Site do not exceed the thresholds for a major source. Therefore the requirements of this rule have been met.

SP (c)(2)(B)

This rule states that all facilities shall comply with all applicable 40 Code of Federal Regulations (CFR), Parts 60, 61, and 63 requirements for New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT).

NSPS Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984 does not apply to the Site's storage tanks due to their capacities and since the condensate is only stored prior to custody transfer.

NSPS KKK – Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants do not apply since the Site is not a natural gas processing plant.

NSPS LLL – Standards of Performance for Onshore Natural Gas Processing: SO_2 Emissions does not apply since the Site does not have a sweetening unit or sweetening unit followed by a sulfur recovery unit.

MACT Subpart ZZZZ- COMP-01 is a new RICE because it was constructed after June 12, 2006. According to §63.6590(c)(1) in the amended regulation, new Spark Ignited Rice must meet the requirements of this part by meeting the requirements of NSPS JJJJ. COMP-02 is an existing RICE because it was constructed before June 12, 2006. According to §63.6603 in the regulation finalized January 15, 2013, existing Spark Ignited Rice with a maximum engine power ≥ 500 HP at remote area sources are required to meet operational and maintenance requirements. COMP-02 will meet these requirements.

NSPS Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines became effective June 28, 2011. According to Title 40 of the Code of Federal Regulations (40 CFR) §60.4230(a)(4)(ii), spark ignition lean burn internal combustion engines with a maximum engine power ≥ 500 HP and ≤ 1350 HP manufactured after January 1, 2008, respectively, are subject to these standards. COMP-01 is subject to this rule and will meet the maintenance and emission limit requirements outlined in the rule text.

MACT Subpart HH - National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities. According to 40 CFR §63.764(e)(1)(ii), since the actual average emissions of benzene from the glycol dehydration unit are below 0.9 megagram per year the unit is subject to limited requirements in this rule. These requirements include keeping on-site records of benzene emission determinations and the natural gas flowrates for the dehydration unit.

The Site is not subject to any Hazardous Air Pollutant (HAP) control requirements listed in 40 CFR Part 61. The Site is not subject to any maximum achievable control requirements listed in 40 CFR Part 63.

SP (c)(2)(D)

This rule states that all facilities shall comply with all applicable requirements of 30 TAC Chapters 111 (Control of Air Pollution from Visible Emissions and Particulate Matter), 112 (Control of Air Pollution from Sulfur Compounds), 113 (Standards of Performance for Hazardous Air Pollutants and for Designated Facilities and Pollutants), 115 (Control of Air Pollution from Volatile Organic Compounds), and 117 (Control of Air Pollution from Nitrogen Compounds).

Explanations of compliance are provided for all applicable rules.

30 TAC Chapter 111 - Control of Air Pollution from Visible Emissions and Particulate Matter Flare control devices found at the site will meet the visible emission requirements listed in 30 TAC 111.111(a)(4). This includes stipulations on visible emissions allowed during periods of time during normal operations.

30 TAC Chapter 112 - Control of Air Pollution from Sulfur Compounds regulates controls needed on emissions related to sulfur compounds. The liquids and gases handled on site do not emit over the prescribed rates.

30 TAC Chapter 113 - Standards of Performance for Hazardous Air Pollutants and for Designated Facilities and Pollutants addresses the control of hazardous air pollutant (HAP) emissions from designated facilities defined within this chapter including municipal solid waste landfills (MSWLFs), medical waste incinerators, and certain other processes/emissions regulated under 40 CFR Parts 61 and 63. The Site will not generate radionuclide emissions and will not include a MSWLF or medical waste incinerator. Consequently, Subchapters B and D are not applicable. The applicability of Subchapter C of this rule, which implements 40 CFR Part 63 by regulating

HAP emissions released from source categories, is discussed above under section (c)(2)(B) of the Non-Rule SP.

30 TAC Chapter 115 - Control of Air Pollution from Volatile Organic Compounds regulates VOC emissions according to source type and Site location (county). The Site is located in Live Oak County which is considered a covered attainment county. However, the equipment at the Site is exempt from this rule because it does not meet the requirements set forth for applicability for covered attainment counties.

30 TAC Chapter 117 - Control of Air Pollution from Nitrogen Compounds includes regulations for major sources of NO_X in ozone nonattainment areas. The Site is located in Live Oak County, which is not listed in the counties of interest as mentioned in this rule text. NOx emitting sources at the Site are exempt from this rule and it's requirements.

SP (c)(3)

This rule states that in order to be eligible for this Standard Permit, an applicant:
(A) shall meet all applicable requirements as set forth in this standard permit;
(B) shall not misrepresent all relevant facts in obtaining the permit; and
(C) shall not be indebted to the state for failure to make payment of penalties or taxes imposed by the commission's jurisdiction.

Burlington will comply with the requirements listed in this rule.

SP (c)(4)(A-D)

All facilities related to the operation of any OGS, under any version of this standard permit (or co-located at a site with an OGS standard permit), previously authorized by permit by rule under 30 TAC Chapter 106 must be incorporated into this standard permit (previous authorizations will be voided), meet all emission limits established by this standard permit and review in accordance with paragraph (b)(8), and meet the requirements of paragraphs (e), (i), and (j) of this standard permit. The requirements in paragraph (h) (BACT) of this standard permit must be met if facilities are changed to increase the potential to emit.

The Site is currently registered under PBR Permit Number 87632. All facilities from that permit are included in this application. Upon the approval of this application please void the previous PBR permit. The Site was not previously authorized under any Standard Permits and will meet the requirements of this rule.

SP (d)

This rule lists the specific facilities that have been evaluated for standard permit registration, as well as facilities that are not authorized under standard permit.

The Site does not include any of the facilities listed in the exclusions list of this rule. Additionally, all the facilities located at the Site are listed in the approved facilities list of this rule. Therefore, the requirements of this rule will be met.

SP (e)(1)

All facilities which have the potential to emit air contaminants must be maintained in good working order and operated properly during facility operations. Each operator shall establish and maintain a program to replace, repair, and/or maintain facilities to keep them in good working order. The minimum requirements of this program shall include:

(A) Compliance with manufacturer's specifications and recommended programs;
(B) cleaning and routine inspection of all equipment; and
(C) replacement and repair of equipment on schedules which prevent equipment failures and maintain performance.

Burlington will comply with the requirements of this rule.

SP (e)(2)

This rule states that any facility shall be operated at least 50 feet from any property line or receptor (whichever is closer to the facility). This distance limitation does not apply to the following:

(A) any fugitive components that are used for isolation and/or safety purposes may be located at 1/2 of the width of any applicable easement;
(B) any facility at a location for which the distance requirements were satisfied at the time this section is claimed, registered, or certified (provided that the authorization was maintained) regardless of whether a receptor is subsequently built or put to use 50 feet from any OGS facility; or
(C) existing facilities which are located less than 50 feet from a property line or receptor when constructed and previously authorized. If modified or replaced the operator shall consider, to the extent that good engineering practice will permit, moving these facilities to meet the 50-foot requirement. Replacement facilities must meet all other requirements of this section.

The Site will satisfy the 50-foot requirement.

SP (e)(3)

This rule states that engines and turbines shall meet the emission and performance standards listed in Table 6 and the following requirements:

(A) liquid fueled engines used for back-up power generation and periodic power needs at the OGS are authorized if the fuel has no more than 0.05% sulfur and the engine is operated less than 876 hours per rolling 12-month period;
(B) engines and turbines used for electric generation more than 876 hours per rolling 12-month period are authorized if no reliable electric service is readily available and 30 TAC §106.352(m) Table 6 is met. In all other circumstances, electric generators must meet the technical requirements of the Air Quality Standard Permit for Electric Generating Unit (EGU) and the emissions shall be included in the registration under this section;
(C) all applicable requirements of Chapter 117 of this title (relating to Control of Air Pollution from Nitrogen Compounds);
(D) all applicable requirements of 40 CFR Parts 60 and 63; and
(E) compression ignition engines that are rated less than 225 kilowatts (300 hp) and emit less than or equal to the emission tier for an equivalent-sized model year 2008 non-road compression ignition engine located at 40 CFR §89.112, Table 1 are authorized.

Burlington will comply with this section.

SP (e)(4)

This rule states that open-topped tanks or ponds containing VOCs or H_2S are allowed up to a potential to emit equal to 1.0 tpy of VOC and 0.1 tpy of H_2S.

This Site does not involve open-topped tanks or ponds containing VOCs or H_2S. Therefore, this rule does not apply.

SP (e)(5)

All process equipment and storage facilities individually must meet the requirements of BACT listed in Table 10 in paragraph (m). Any combination of process equipment and storage facilities with an uncontrolled PTE of equal to or greater than 25 tpy of VOC must also meet the requirements of Table 10, row titled "Combined Control Requirements". All of the following streams and facilities must be included for this site-wide assessment:

(A) For any gaseous vent stream with a concentration of 1% VOC must be considered for capture and control requirements;

(B) For any liquid stream with a potential to emit of equal to or greater than 1 tpy VOC for each vessel or storage facility.

The equipment at the Site will meet the requirements of this rule.

SP (e)(6)

This rule includes requirements for fugitive components based upon the total site fugitive emissions. If the site is subject to LDAR control program, the requirements outlined in Table 9 must be followed.

The emissions represented in this application are done so in accordance with this rule. This Site is not required to utilize the LDAR control program.

SP (e)(7)

This rule states requirements for tanks and vessels that use a paint color to minimize the effects of solar heating. Solar absorptance should be 0.43 or less, as referenced in AP-42 Table 7.1 – 6 and paint shall be applied in sufficient quantity as to be considered solar resistant. Paint coatings shall be maintained in good condition and will not compromise tank integrity. Minimal amounts of rust may be present not to exceed 10% of the external surface area of the roof or walls of the tank and in no way may compromise tank integrity.

The Site includes a number of liquid storage tanks which will comply with the requirements of this rule.

SP (e)(8)

This rule states that all emission estimation methods including computer programs must be used with monitoring data generated in accordance with Table 8 in section (m). All emission estimation methods must also be used in a way that are consistent with protocols established by the commission or promulgated in federal regulations (NSPS, NESHAPS). Where control is relied upon to meet paragraph (k) (emission limits based on impact evaluation), control monitoring is required.

The Site will comply with all applicable monitoring and record demonstration requirements, and all emission estimation methods will comply with the requirements of this rule.

SP (e)(9)

This rule states that process reboilers, heaters, and furnaces that are also used for control of waste gas streams:

(A) may claim 50% to 99% destruction efficiency for VOCs and H_2S depending on the design and level of monitoring applied. The 90% destruction may be claimed where the waste gas is delivered to the flame zone or combustion fire box with basic monitoring as specified in 30 TAC §106.352(j). Any value greater than 90% and up to 99% destruction efficiency may be claimed where enhanced monitoring and/or testing are applied as specified in 30 TAC §106.352(j);

(B) if the waste gas is premixed with the primary fuel gas and used as the primary fuel in the device through the primary fuel burners, 99% destruction may be claimed with basic monitoring as specified in 30 TAC §106.352(j);

(C) in systems where the combustion device is designed to cycle on and off, records of run time and enhanced monitoring are required to claim any run time beyond 50%.

There are no heaters at the Site; therefore, this rule does not apply.

SP (e)(10)

This rule states that Vapor Recovery Systems (VRSs) may claim up to 100% control. The VRUs must meet the appropriate design, monitoring, and recordkeeping in subsection (m) Table 7 and Table 8.

The Site has a VRU and is claiming 100% control. The VRU will meet the appropriate design, monitoring, and recordkeeping requirements in subsection (m) Tables 7 and 8.

SP (e)(11)

This rule includes design parameters that are required of flare combustion ctorl devices in order to be able to claim a 98% destruction efficiency of 98% for VOCs and H2S and 99% for VOCs containing no more than three carbon atoms that contain no elements other than carbon and hydrogen.

The Site has three flare combustion control devices and is claiming a destruction efficiency of 98%. The Site will meet the design parameters required for this destruction efficiency.

SP (e)(12)

This rule establishes the design destruction efficiency that thermal oxidation and vapor combustion control devices may claim, depending on the design and level of monitoring applied, variability of waste gas streams to control, and stack testing.

The Site does not involve the use of thermal oxidizers; therefore, this rule does not apply.

SP (f)(1)

This rule states that for all previous claims of this standard permit (or previous version of this standard permit) existing authorized facilities, or group of facilities, are not required to meet the requirements of this standard permit, with the exception of planned MSS, until a renewal under the standard permit is submitted after December 31, 2015.

The Site is not an existing authorized facility under a previous version of the SP; therefore, this rule does not apply.

SP (f)(2)

This rule states that if no other changes, except for authorizing planned MSS, occur at an existing site under this standard permit, or any previous version of this standard permit, paragraph (b)(7) applies.
(A) Records demonstrating compliance Paragraph (i) must be kept;
(B) If the OGS must certify emissions to establish nonapplicability of prevention of significant deterioration (PSD), nonattainment new source review (NNSR), or the federal operating permits program, this certification may be filed using form APD-CERT. No fee is required for this certification;
(C) Planned MSS shall be incorporated at the next revision or update to a registration under this standard permit after January 5, 2012, and no later than any renewal submitted after December 31, 2015.

The Site is not an existing authorized facility under this SP or a previous version of the SP; therefore, this rule does not apply.

SP (f)(3)

This rule states that facilities, groups of facilities or planned MSS from facilities registered under this standard permit cannot be authorized by a permit under 30 TAC 116.111, General Application.

This registration includes planned MSS emissions authorized under the Non-Rule Oil & Gas Standard Permit.

SP (f)(4)

This rule states that prior to construction or implementation of changes for any project which meets this standard permit, a notification shall be submitted through the ePermits system (or hard copy). This notification shall include the following:
(A) Identifying information (Core Data) and a general description of the project.
(B) A fee of $25 for small businesses as defined in 30 TAC §106.50 (Registration Fees for Permits by Rule), or $50 for all others.

An initial notification meeting these requirements was submitted to the TCEQ via the ePermits system on February 8, 2013.

SP (f)(5)

This rule states that for any registration which meets the emission limitations of this standard permit must meet the following:
(A) Within 90 days after start of operation or implemented changes (whichever occurs first), the facilities must be registered with a PI-1S Standard Permit Application.
(B) Include a detailed summary of maximum emissions estimates based on representative gas and liquid analysis, equipment design specifications and operations, material type and throughput, other parameters for determining emissions, and documentation demonstrating compliance with applicable requirements.
(C) Pay registration fee of $475 for small businesses, or $850 for all others.
(D) Construction may begin any time after receipt of written notification to the executive director. Operations may continue after receipt of registration if there are no objections or 45 days after receipt by the executive director of the registration, whichever occurs first.

This SP registration is being submitted in accordance with these requirements.

SP (f)(6)

This rule states that if an OGS emissions increase, either through a change in production or addition of facilities, the site may change authorization (Level 1 or Level 2 PBR in 30 TAC §106.352 or Standard Permit) within 90 days from the initial notification of construction of an oil and gas facility or within 90 days of the change of production or installation of additional equipment, by submitting an initial registration or revision to the PBR or Standard Permit.

At the time of this registration, Burlington maintains that the Site should be permitted under the SP level, as reflected in the initial notification.

SP (f)(7)

This rule states that all registrations, registration revisions, and renewals shall be submitted to the commission through a PI-1S Standard Permit Registration Form. Fee requirements do not apply when there are changes in representations with no increase in emissions within 6-months after a standard permit registration has been issued.

A PI-1S Standard Permit Registration Form is part of this initial SP registration; therefore, the requirements of this rule will be met.

SP (g)

This rule states that any claim under this standard permit must comply with all applicable requirements of 30 TAC §116.610; §116.611, Registration to Use a Standard Permit; §116.614, Standard Permit Fees; and §116.615, General Conditions. This standard permit supersedes: the notification requirements of 30 TAC §116.615, General Conditions; and the emission limitations of 30 TAC §116.610(a)(1), Applicability.

This SP registration complies with all applicable requirements as listed in this rule and discussed later in this section; therefore, the requirements of this rule will be met.

SP (h)

Total maximum estimated registered or certified emissions shall meet the most stringent of the following:
(1) The applicable limits for a major stationary source or major modification for PSD and NNSR as specified in 30 TAC §116.12.
(2) Paragraph (k) of this standard permit.
(3) The limits set forth by Paragraph (h)(3).

The Site complies with this rule. Refer to Attachment 5 for the Impacts Evaluation.

SP (i)(1)

This rule states that prior to January 5, 2012, representations and registration of planned MSS is voluntary, but if represented must meet the applicable limits of the standard permit. After January 5, 2012, all emissions from planned MSS activities and facilities must be considered for compliance with applicable limits of the standard permit unless otherwise stated in (b)(7). This section may not be used at a site or for facilities authorized under §116.111 of this title if planned MSS has already been authorized under that permit.

The Site has not been previously authorized under §116.111. Burlington has voluntarily included MSS activities in this SP registration submittal as opposed to the delayed compliance date. Therefore, the requirements of this rule will be met.

SP (i)(2)

This rule states that releases of air contaminants during, or as result of, planned MSS must be quantified and meet the emission limits in this standard permit, as applicable. This analysis must include:
(A) alternate operational scenarios or redirection of vent streams;
(B) pigging, purging, and blowdowns;
(C) temporary facilities if used for degassing or purging of tanks, vessels, or other facilities;
(D) degassing or purging of tanks, vessels, or other facilities; and
(E) management of sludge from pits, ponds, sumps, and water conveyances.

This submittal includes emissions representations for alternate operational scenarios during maintenance events. The first scenario occurs when the VRU is down for maintenance and the flare is used as a back-up to control the emissions. Emissions related to the use of the flare to control emissions from the tanks are represented in this application as an SMSS event.

The second scenario occurs when the engines located at the site goes down for maintenance. Engine downtime would result in gas released from the compressors and in turn from the engines starter vent. All gas from the blowdowns is sent to the flare. The proposed site emissions include this maintenance event and the resulting combustion emissions.

The proposed site emissions include this maintenance event and the resulting combustion emissions. All other MSS activities listed in this rule do not apply to the Site.

SP (i)(3)

This rule states that other planned MSS activities authorized by this standard permit are limited to the following. These planned MSS activities require only recordkeeping of the activity.
(A) Routine engine component maintenance including filter changes, oxygen sensor replacements, compression checks, overhauls, lubricant changes, spark plug changes, and emission control system maintenance.
(B) Boiler refractory replacements and cleanings.
(C) Heater and heat exchanger cleanings.
(D) Turbine hot standard permit swaps.
(E) Pressure relief valve testing, calibration of analytical equipment; instrumentation/analyzer maintenance; replacement of analyzer filters and screens.

Burlington will maintain records for the planned MSS activities listed in this SP registration; therefore, the requirements of this rule are met.

SP (i)(4)

This rule states that engine and compressor startups associated with preventative system shutdown activities have the option to be authorized as part of typical operations if:
(A) prior to operation, alternative operating scenarios to divert gas or liquid streams are registered and certified with all supporting documentation;
(B) engine/compressor shutdowns shall result in no greater than 4 lb/hr of natural gas emissions; and

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(C) emissions which result from the subsequent compressor startup activities are controlled to a minimum of 98% efficiency for VOC and H_2S.

Burlington will comply with this section.

SP (j)

This rule states requirements for sampling, monitoring, and records. The following records shall be maintained at the facility site (or an office within Texas having day-to-day operational control of the plant site) in written or electronic form and be readily available to the agency or local air pollution control program with jurisdiction upon request.
(1) Sampling and demonstrations of compliance shall include the requirements listed in Paragraph (m) Table 7.
(2) Monitoring and records for demonstrations of compliance shall include the requirements listed in Paragraph (m) Table 8.

Burlington will perform the sampling and monitoring activities and maintain the appropriate records as required in Paragraph (m) Tables 7 and 8; therefore, the requirements of this rule will be met.

SP (k)(1)-(2)

This rule states all impacts evaluations must be completed on a contaminant-by-contaminant basis for any net emissions increases resulting from a project and must meet the following as appropriate:
(A) Compliance with state or federal ambient air standards for nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and H_2S shall be demonstrated using the shortest distance from any emission point, vent, or fugitive component to the nearest property-line within 1 mile of a project.
(B) Compliance with hourly and annual ESLs for benzene shall be demonstrated using the shortest distance from any emission point, vent, or fugitive component to the nearest receptor within 1 mile of a project.

Impacts analyses were conducted in accordance with this rule. Please refer to attachment 5 for the impacts evaluation.

SP (k)(3)

This rule states that impacts evaluations are not required under the following cases:
(A) If there is no receptor within 1 mile of a registration, no further ESL review is required.
(B) If there is no property line within 1 mile of a registration, no further ambient air quality standard review is required.
(C) If the project total emissions are less than 0.039 lb/hr benzene, 0.025 lb/hr H_2S, 2 lb/hr SO_2, or 4 lb/hr NO_2, no additional analysis or demonstration of the specified air contaminant is required.

Hourly total emissions for NO_x, Benzene, and H_2S exceed the limits in subsection (C). Therefore, impact evaluations are required for each of these contaminants and are included in Attachment 5.

SP (k)(4)

This rule states that emission evaluations shall meet the following:
(A) For all evaluations of NO_X to NO_2, a conversion factor of 0.20 for 4-stroke rich and lean-burn engines and 0.50 for 2-stroke lean-burn engines may be used.

(B) The maximum predicted concentration or rate at the property boundary or receptor, whichever is appropriate, must not exceed a state or federal ambient air standard or ESL.

Emission evaluations were conducted in accordance with this rule. As shown in Attachment 5, the maximum predicted concentrations at the property boundary or receptor were below the state or federal ambient air standard.

SP (k)(5)(A)

This rule states that the following shall be met for ESL reviews:
(i) If a project's air contaminant maximum predicted concentrations are equal to or less than 10% of the appropriate ESL, no further review is required.
(ii) If a project's air contaminant maximum predicted concentrations combined with project increases for that contaminant over a 60-month period after the effective date of this revised section are equal to or less than 25% of the appropriate ESL, no further review is required.
(iii) In all other cases, all facility emissions at an OGS, regardless of authorization type, located within 1 mile of a project requiring registration under this section shall be evaluated.

Burlington has evaluated all Site emissions for impacts analysis purposes. Refer to Attachment 5 for modeling results.

SP (k)(5)(B)

This rule states that the following shall be met for state and federal ambient air quality standard reviews:
(i) If a project's air contaminant maximum predicted concentrations are equal to or less than the significant impact level (also known as de minimis impact in Chapter 101 of this title (relating to General Air Quality Rules)), no further review is required;
(ii) In all other cases, all facility emissions at an OGS, regardless of authorization type, located within 1 mile of a project requiring registration under this section shall be evaluated.

Please refer to Attachment 5.

SP (k)(6)

This rule states that evaluation must comply with one of the methods listed with no changes or exceptions.
(A) Emission impact Tables 2 - 5F in Paragraph (m) may be used in accordance with the limits and descriptions in Paragraph (m) Table 1.
(B) A screening model may be used to demonstrate acceptable emissions from an OGS under this section if all of the parameters in the screening modeling protocol provided by the commission are met.
(C) A refined dispersion model may be used to demonstrate acceptable emissions from an OGS if all of the parameters in the refined dispersion modeling protocol provided by the commission are met.

Screen modeling was used to satisfy the requirements of this rule for the NOx emissions impacts analysis. The TCEQ provided impact Tables were utilized for Benzene and H_2S. These results are provided in Attachment 5.

SP (l)

This paragraph states that 30 TAC §116.620 is applicable for existing unchanged facilities and new or changing facilities as specified in paragraph (a)(1) of this standard permit.

Burlington has voluntarily elected to comply with paragraphs (a) through (k) of this Non-Rule SP. Therefore, paragraph (l) of this rule is not applicable.

<u>30 TAC §116.610. Applicability, effective February 1, 2006</u>

30 TAC §116.610(a)(1)

This paragraph of the TCEQ standard permit applicability rules requires that any project with a net increase in any air contaminant other than carbon dioxide, water, nitrogen, methane, ethane, hydrogen, oxygen, or those for which a National Ambient Air Quality Standard (NAAQS) has been established must meet the emission limitations of 30 TAC §106.261(2) or (3) or §106.262(2), unless otherwise specified by a particular standard permit.

The Site is electing to comply with the requirements of the Non-Rule Air Quality Standard Permit for Oil and Gas Handling and Production Facilities effective February 27, 2011, which supersedes the emission limitations of this rule. Therefore, this rule does not apply.

30 TAC §116.610(a)(2)

This rule states that a project authorized by standard permit must meet the conditions of the standard permit in effect at the time construction or operation is commenced.

The Site will meet the requirements of the Non-Rule Air Quality SP for Oil and Gas Handling and Production Applicability effective February 27, 2011. Should another SP come into effect prior to TCEQ concurrence with this SP authorization, Burlington will comply with the requirements of that version of the SP.

30 TAC §116.610(a)(3)

This rule requires that the project comply with applicable provisions of the Federal Clean Air Act (FCAA), §111 (concerning New Source Performance Standards (NSPS), as listed under 40 Code of Federal Regulations (CFR) Part 60.

The applicability of this rule is discussed above under section (c)(2)(B) of the Non-Rule SP.

30 TAC §116.610(a)(4)

This rule requires that the proposed project comply with the applicable provisions of the FCAA, §112 concerning Hazardous Air Pollutants (HAPs), as listed under 40 CFR Part 61.

The applicability of this rule is discussed above under section (c)(2)(B) of the Non-Rule SP.

30 TAC §116.610(a)(5)

This rule states that the project must comply with applicable maximum achievable control technology (MACT) standards listed under 40 CFR Part 63 or 30 TAC Chapter 113, Subchapter C relating to National Emissions Standards for Hazardous Air Pollutants.

The applicability of this rule is discussed above under section (c)(2)(B) of the Non-Rule SP.

30 TAC §116.610(a)(6)

This rule applies to facilities that are subject to the Mass Emissions Cap and Trade requirements listed in 30 TAC Chapter 101, Subchapter H, Division 3.

These requirements do not apply to the Site, which is located in Live Oak County, Texas.

30 TAC §116.610(b)

This rule states that any project, except those authorized under 30 TAC §116.617 of this title (relating to Standard Permits for Pollution Control Permits), which constitute a new major source or major modification under the new source review requirements of the FCAA, Part C or Part D is subject to the requirements of 30 TAC §116.110 rather than 30 TAC Chapter 116 Subchapter F.

The Site is not a major source of air pollutants, with respect to Prevention of Significant Deterioration (PSD) permitting regulations. The Site is located in Live Oak County, which is an attainment county; therefore, the Site is not required to be evaluated for nonattainment permitting requirements.

30 TAC §116.610(c)

This rule prohibits circumvention of the requirements of 30 TAC §116.110 by artificial limitations.

Burlington is not taking any artificial limitations on the Site's emissions. Therefore, the condition of this rule has been met.

30 TAC §116.610(d)

This rule states that any project involving a proposed affected facility (as defined in §116.15(1) of this title (relating to Section 112(g) Definitions)) shall comply with all applicable requirements under Subchapter C of this chapter (relating to Hazardous Air Pollutants: Regulations Governing Constructed and Reconstructed Major Sources (FCAA, §112(g), 40 CFR Part 63)).

The Site is not subject to FCAA §112(g), 40 CFR Part 63 requirements, referenced in 30 TAC Chapter 116 Subchapter C.

30 TAC §116.611. Registration to Use a Standard Permit, effective December 11, 2002

This rule states that, if required, registration to use a standard permit shall be sent by certified mail, return receipt requested, or hand delivered to the executive director, the appropriate commission regional office, and any local air pollution program with jurisdiction, before a standard permit can be issued. The registration, at a minimum, must include the basis of the air emission estimates, quantification of all emission increases and decreases associated with the project, sufficient information to demonstrate the project's compliance with §116.610(b), information describing efforts to minimize emissions increases that will result from the project, a description of the project and related processes, and a description of any equipment installed. A certified registration must be submitted to avoid applicability of Chapter 122 and be maintained in accordance with §116.115.

A certified registration for this Site is being submitted to the appropriate state and local entities using the required forms and including all appropriate demonstrations of compliance with the requirements of this rule.

__30 TAC §116.614. Standard Permit Fees, effective October 20, 2002__

This rule states that any person who registers to use a standard permit or an amended standard permit, or to renew a registration to use a standard permit shall remit at the time of registration, a flat fee of $900 for each standard permit being registered. All standard permit fees will be remitted in the form of a check, certified check, electronic funds transfer, or money order made payable to the TCEQ and delivered with the permit registration.

A fee of $850.00 for this SP is being remitted to the TCEQ with the SP registration. A fee of $50.00 was submitted with the initial notification on February 8, 2013.

__30 TAC §116.615. General Conditions, effective March 15, 2007__

30 TAC §116.615(1)

This condition states that emissions from the facility must comply with all applicable rules and regulations adopted under Texas Health and Safety Code, Chapter 382, and with the intent of the Texas Clean Air Act (TCAA), including protection of health and property of the public.

The Site emissions will comply with all TCEQ rules and regulations as well as with thc intent of the TCAA, including protection of the health and property of the people near the Site.

30 TAC §116.615(2)

This condition states that all representations with regard to construction plans, operating procedures, and maximum emission rates in any registration package become conditions upon which the facility, or changes thereto, must be constructed and operated.

The Site will be operated as represented in this SP. If any representation changes occur, Burlington will verify that the emission sources remain eligible for a SP and notify the executive director of any changes no later than 30 days after the change, in accordance with this condition.

30 TAC §116.615(3)

This condition states that all changes authorized under standard permit to a facility previously authorized under 30 TAC §116.110 shall be incorporated into that permit at such time as the permit is amended or renewed.

The Site was not previously authorized under 30 TAC §116.110; therefore, this condition does not apply.

30 TAC §116.615(4)

This condition states that start of construction, construction interruptions exceeding 45 days, and completion of construction shall be reported to the appropriate regional office not later than 15 working days after occurrence of the event, unless otherwise specified in the standard permit.

Burlington will comply with the reporting requirements listed in this condition.

30 TAC §116.615(5)

This condition lists requirements associated with start-up notification to the appropriate air program regional office and any other air pollution control program having jurisdiction.

This rule is not applicable for sites subject to the Non-Rule Air Quality SP for Oil and Gas Handling and Production Facilities Applicability sections (a)-(k).

30 TAC §116.615(6)

This condition contains requirements associated with stacks or process vents required to perform sampling operations.

Burlington will continue to conduct sampling required by this SP, as applicable. Should the TCEQ request stack sampling of other sources authorized by this SP, Burlington will comply with this section.

30 TAC §116.615(7)

This condition requires that the standard permit holder demonstrate or otherwise justify the equivalency of emission control methods, sampling or other emission testing methods, and monitoring methods proposed as alternatives to methods indicated in the conditions of the standard permit.

Burlington is not proposing alternative emission control methods, sampling or other emission testing methods, or monitoring methods at this time. Should Burlington elect to propose such alternatives, Burlington will do so in accordance with this condition.

30 TAC §116.615(8)

This condition contains the recordkeeping requirements associated with the standard permit.

Burlington will retain a copy of the SP along with information and data sufficient to demonstrate applicability of, and compliance with, the SP and will be made available at the request of representatives of the executive director, the EPA, or any air pollution control program having jurisdiction.

30 TAC §116.615(9)

This condition requires that facilities covered by the standard permit not be operated unless all air pollution emission capture and abatement equipment is maintained in good working order and operating properly during normal facility operations.

Equipment will not be operated unless the air emissions control equipment is operating properly during normal facility operations. Any emission events that are not included in this SP will be reported in accordance with 30 TAC §101.201 and §101.211.

30 TAC §116.615(10)

This condition states that registration of a standard permit by a standard permit applicant constitutes an acknowledgement and agreement that the holder will comply with all rules, regulations, and orders of the commission issued in conformity with the TCAA and the conditions precedent to the claiming of the standard permit.

Burlington will comply with all applicable rules, regulations, and orders of the commission.

30 TAC §116.615(11)

This condition states that if a standard permit for a facility requires a distance, setback, or buffer from other property or structures as a condition of the permit, the determination of whether the distance, setback, or buffer is satisfied shall be made on the basis of conditions existing at the earlier of:

(A) the date new construction, expansion, or modification of a facility begins; or
(B) the date any application or notice of intent is first filed with the commission to obtain approval for the construction or operation of the facility.

Burlington will comply with the distance determination requirements stated in this rule, as applicable.

Air Quality Standard Permits (SP)
General Requirements Checklist
Title 30 Texas Administrative Code §§116.610-116.615

TCEQ

Check the most appropriate answer and include any additional information in the spaces provided. If additional space is needed, please include an extra page and reference the rule number. The SP forms, tables, checklists, and guidance documents are available from the TCEQ, Air Permits Division web site at: www.tceq.state.tx.us/permitting/air/nav/standard.html.

Most Standard Permits require registration with the commission's Office of Permitting, Remediation, and Registration in Austin. The facilities and/or changes to facilities can be registered by completing a **Form PI-1S**, "Registration for Air Standard Permit." This checklist should accompany the registration form to expedite any registration review.

CHECK THE MOST APPROPRIATE ANSWERS AND FILL IN THE REQUESTED INFORMATION

Rule	Questions/Description	Information	Response
116.610 (a)(1)	Are there net emissions increases associated with this registration?	Attach emissions summary & calculations	☑ YES ☐ NO
	If "YES," will net emission increases of air contaminants from the project, other than those for which a National Ambient Air Quality Standard (NAAQS) has been established, meet the emission limits of § 106.261 or § 106.262?		☐ YES ☑ NO
	If "NO," does the specific standard permit exempt emissions from this limit?		☑ YES ☐ NO
116.610 (a)(3)	Do any of the Title 40 Code of Federal Regulations Part (CFR) 60, New Source Performance Standards apply to this registration? *If "YES," list subparts*	List subparts: NSPS JJJJ	☐ YES ☑ NO
116.610 (a)(4)	Do any Hazardous Air Pollutant requirements apply to this registration? *If "YES," list subparts*	List subparts:	☐ YES ☑ NO
116.610 (a)(5)	Do any maximum achievable control technology (MACT) standards as listed under 40 CFR Part 63 or Chapter 113, Subchapter C (National Emissions Standard for Hazardous Air for Source Categories) apply to this registration? *If "YES," list subparts*	List subparts: MACT ZZZZ, MACT HH	☑ YES ☐ NO
116.610 (a)(6)	Will additional emission allowances under Chapter 101, Subchapter H, Division 3, Emissions Banking and Trading, need to be obtained following this registration?		☐ YES ☑ NO

Air Quality Standard Permits (SP)
General Requirements Checklist
Title 30 Texas Administrative Code §§116.610-116.615

TCEQ

CHECK THE MOST APPROPRIATE ANSWERS AND FILL IN THE REQUESTED INFORMATION

Rule	Questions/Description	Information	Response
116.611 (a) (1-6)	Is the following documentation included with this registration:		☑YES ☐NO
	Emissions calculations including the basis of the calculations?		☑YES ☐NO
	Quantification of all emission increases and/or decreases associated with this project?		☑YES ☐NO
	Sufficient information demonstrating that this project does not trigger PSD or NNSR review?		☑YES ☐NO
	Description of efforts to minimize collateral emissions increases associated with this project?		☑YES ☐NO
	Process descriptions including related processes?		☑YES ☐NO
	Description of any equipment being installed?		☑YES ☐NO
116.614	Are the required fee and a copy of the check or money order provided with the application?		☑YES ☐NO
116.615 (1)	Will emissions from the facility comply with all applicable rules and regulations of the commission adopted under Texas Health and Safety Code, Chapter 382, and with the intent of the Texas Clean Air Act?		☑YES ☐NO
116.615 (2)	Do you understand that all representations with regard to construction plans, operating procedures, and maximum emission rates in this registration become conditions upon which the facility will be constructed and operated?		☑YES ☐NO
116.615 (3)	Do you understand that all changes authorized by this registration need to be incorporated into the facility's permit if the facility is currently permitted under §116.110 (relating to Applicability)?	*List all related permit numbers:* 94696	☑YES ☐NO
116.615 (9) 617 (e)(1)	Will all air pollution emission capture and abatement equipment be maintained in good working order?		☑YES ☐NO
116.615 (10)	Will the facility comply with all applicable rules and regulations of the TCEQ, the Texas Health and Safety Code, Chapter 382, and the Texas Clean Air Act?		☑YES ☐NO

ATTACHMENT 5
IMPACTS EVALUATION

OIL AND GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB – BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

SUMMARY OF NO_X SCREEN3 MODELING RESULTS
OIL AND GAS STANDARD PERMIT REGISTRATION
SUGARKANE CTB - BAKER DEHY UNIT
BURLINGTON RESOURCES OIL & GAS COMPANY LP

FIN	EPN	Description	$PTE_{(NO_x,HR)}$[a] (lb/hr)	$C_{(NO_x,HR)}$[b] (µg/m³)	$GLC_{(NO_x,HR)}$[c] (µg/m³)	$R_{(NO_2/NO_x)}$[d] (lb NO_2/lb NO_X)	$GLC_{(NO_2,HR)}$[e] (µg/m³)	Annual Conversion Factor (CF)	$GLC_{(NO_2,YR)}$[f] (µg/m³)
Normal Operations									
COMP-01	COMP-01	Compressor Engine 1	2.95	12.46	36.76	0.20	7.35	0.08	0.59
COMP-02	COMP-02	Compressor Engine 2	2.78	14.50	40.31	0.20	8.06	0.08	0.64
REB-1	REB-1	Glycol Reboiler No. 1	0.05	441.90	22.10	0.75	16.57	0.08	1.33
FL-1	FL-1	Flare Combustion (normal operations pilot)	0.003	152.30	0.46	0.75	0.34	0.08	0.03
FL-1	FL-1	Flare Combustion (normal operations assist gas)	0.22	12.48	2.75	0.75	2.06	0.08	0.16
FL-2	FL-2	Flare Combustion (normal operations pilot)	0.003	152.30	0.46	0.75	0.34	0.08	0.03
FL-2	FL-2	Flare Combustion (normal operations assist gas)	0.22	12.48	2.75	0.75	2.06	0.08	0.16
FL-3	FL-3	Flare Combustion (normal operations pilot)	0.003	152.30	0.46	0.75	0.34	0.08	0.03
FL-3	FL-3	Flare Combustion (normal operations assist gas)	0.22	12.48	2.75	0.75	2.06	0.08	0.16
FL-3	FL-3	Flare Combustion (normal operations waste gas condensate)	0.58	5.70	3.31	0.75	2.48	0.08	0.20
FL-3	FL-3	Flare Combustion (normal operations waste gas Produced water)	0.01	103.80	1.04	0.75	0.78	0.08	0.06
Maintenance, Startup, and Shutdown									
FL-1-SMSS	FL-1-SMSS	Flare Combustion (engines blowdown waste gas)	0.24	11.72	2.81	0.75	2.11	0.08	0.17
FL-2-SMSS	FL-2-SMSS	Condensate and Slop Waste Gas Combustion (during VRU downtime)	0.78	4.47	3.49	0.75	2.62	0.08	0.21
FL-2-SMSS	FL-2-SMSS	Produced Water Waste Gas Combustion (during VRU downtime)	0.02	72.64	1.45	0.75	1.09	0.08	0.09
						Total Engine NO_2 Concentration (µg/m³):	**48.26**		**3.86**
						Live Oak County NO_2 Background Concentration (µg/m³)[g]:	**70.00**		**20.00**
						Total Off-Property Concentration (µg/m³):	**118.26**		**23.86**
						NO_2 NAAQS (µg/m³):	**188**		**100**

[a] $PTE_{(NO_x,HR)}$ = Hourly PTE NO_X.

[b] $C_{(NO_x,HR)}$ = Hourly NO_X concentration predicted by SCREEN3 model, using a nominal 1 lb/hr NO_X emission rate.

[c] $GLC_{(NO_x,HR)}$ = Hourly ground level concentration of NO_X.
An example calculation for hourly NO_X ground level concentration for FIN FL-1 (normal operations pilot) follows:
$GLC_{(NO_x,HR)} = PTE_{(NO_x,HR)} * C_{(NO_x,HR)}$
$GLC_{(NO_x,HR)}$ = 0.003 lb/hr * 152.3 µg/m³/1 lb/hr
$GLC_{(NO_x,HR)}$ = 0.46 µg/m³ NO_X

[d] $R_{(NO_2/NO_x)}$ = NO_2/NO_X ratio from TCEQ guidance and section (k) of the Non-Rule Standard Permit (attached).

[e] $GLC_{(NO_2,HR)}$ = Hourly ground level concentration of NO_2.
An example calculation for hourly NO_2 ground level concentration for FIN FL-1 follows:
$GLC_{(NO_2,HR)} = GLC_{(NO_x,HR)} * R_{(NO_2/NO_x)}$
$GLC_{(NO_2,HR)}$ = 0.46 µg/m³ * 0.75 lb NO_2/lb NO_X
$GLC_{(NO_2,HR)}$ = 0.34 µg/m³ NO_2

[f] $GLC_{(NO_2,YR)}$ = Annual ground level concentration of NO_2.
An example calculation for annual NO_2 ground level concentration for FIN FL-1 follows:
$GLC_{(NO_2,YR)} = GLC_{(NO_2,HR)} * CF$
$GLC_{(NO_2,YR)}$ = 0.34 µg/m³ * 0.08
$GLC_{(NO_2,YR)}$ =0.03 µg/m³ NO_2

[g] The hourly and annual NO_2 background concentration is based on TCEQ Guidance.

Maximum concentrations are shown for each stream sent to the Flare. Note that, the maximum distance is not the same for each stream, but representing all at the maximum concentration is the most conservative approach. Additionally, not all events shown here would occur at the same time (MSS events would not occur during normal operations events), therefore the emissions shown are conservatively represented.

BENZENE EMISSION IMPACT ANALYSIS
OIL AND GAS STANDARD PERMIT REGISTRATION
SUGARKANE CTB - BAKER DEHY UNIT
BURLINGTON RESOURCES OIL & GAS COMPANY LP

Hourly ESL (µg/m3): 170
Annual ESL (µg/m3): 4.5

EPN	FIN	Benzene Emissions (lb/hr)	Benzene Emissions (tpy)	Stack Parameters Distance (ft)	Stack Parameters Height (ft)	G (µg/m³/lb/hr)	WR (hourly)	WR (annual)	Calculated Health Effects Review (lb/hr)	Calculated Health Effects Review (tpy)
Normal Operations										
COMP-01	COMP-01	0.01	0.04	1450	20	14	3.88%	11.27%	0.47	1.98
COMP-02	COMP-02	0.006	0.03	1480	20	14	2.33%	8.46%	0.28	1.49
FUG	FUG	0.02	0.09	1043	3	293	7.76%	25.37%	0.05	0.21
REB-1	REB-1	0.000001	0.000004	1830	14	76	0.0004%	0.001%	0.00001	0.00004
REB-1	DEHY-SV	0.04	0.17	1830	14	76	15.52%	47.91%	0.35	1.55
FL-3	TK-20	0.005	0.01	1752	30	31	1.94%	2.82%	0.11	0.22
FL-3	TK-21	0.0002	0.001	1752	30	31	0.08%	0.28%	0.004	0.02
VRU	TRUCK1	0.003	0.002	1270	10	264	1.16%	0.56%	0.01	0.01
VRU	TRUCK2	0.0001	0.00001	1270	10	264	0.04%	0.003%	0.0002	0.00003
FL-3	TRUCK3	0.01	0.003	1750	30	31	3.88%	0.85%	0.21	0.07
FL-3	TRUCK4	0.0001	0.00001	1750	30	31	0.04%	0.003%	0.0021	0.00022
FL-1	FL-1	0.000003	0.00001	1420	30	36	0.001%	0.003%	0.0001	0.0002
FL-2	FL-2	0.000003	0.00001	1450	30	36	0.001%	0.003%	0.0001	0.0002
FL-3	FL-3	0.000003	0.00001	1750	30	31	0.001%	0.003%	0.0001	0.0002
Maintenance, Startup, and Shutdown										
COMP-01-SV	COMP-01-SV	0.07	0.002	1450	20	16	27.16%	0.56%	2.89	0.09
FL-1-SMSS	COMP-01-BD	0.001	0.00002	1420	30	36	0.39%	0.01%	0.02	0.0004
COMP-02-SV	COMP-02-SV	0.07	0.002	1480	20	16	27.16%	0.56%	2.89	0.09
FL-1-SMSS	COMP-02-BD	0.001	0.00002	1450	30	36	0.39%	0.01%	0.02	0.0004
FL-2-SMSS	TK-01 through TK-08	0.01	0.004	1450	30	36	3.88%	1.13%	0.18	0.08
FL-2-SMSS	TK-09	0.001	0.0002	1450	30	36	0.39%	0.056%	0.02	0.004
FL-2-SMSS	TK-10 through TK-19	0.0002	0.0001	1450	30	36	0.08%	0.03%	0.004	0.002
FL-2-SMSS	TRUCK1	0.01	0.0004	1450	30	36	3.88%	0.11%	0.18	0.01
FL-2-SMSS	TRUCK2	0.0001	0.000002	1450	30	36	0.04%	0.001%	0.002	0.00004
	Total	0.26	0.35						7.68	5.82

Impacts Analysis:

	Hourly	Annual
Calculated Benzene Emissions (lb/hr):	0.26	0.35
Calculated Benzene Health Effects Review (lb/hr):	7.68	5.82

Per the non-Rule Oil and Gas Standard Permit (k)(4)(B), the site's air contaminant maximum predicted concentrations are less than the appropriate ESL. Therefore the impacts analysis meets the requirements of the Oil and Gas Standard Permit.

Health Effects Calculations and Impact factors G and WR, and equations from Air Quality Standard Permit for Oil and Gas Handling and Production Facilities (k) and Tables
Table 1: Emission Impact Tables Limits and Descriptions
Table 2: Fugitives and Process Vents Table
Table 3: Flares and Thermal Destruction Devices
Short-Term ESL 170 µg/m³ and Long-Term ESL 4.5 µg/m³ per TCEQ Development Support Document Benzene CAS #: 71-43-2, dated October 15, 2007

NOTE: Not all events shown here would occur at the same time (MSS events would not occur during normal operations events), therefore the analysis shown is conservatively represented.

H_2S EMISSION IMPACT ANALYSIS
OIL AND GAS STANDARD PERMIT REGISTRATION
SUGARKANE CTB - BAKER DEHY UNIT
BURLINGTON RESOURCES OIL & GAS COMPANY LP

State Property Line Standard (μg/m3): 108

EPN	FIN	Description	H_2S Emissions (lb/hr)	Stack Parameters Distance (ft)	Stack Parameters Height (ft)	G (μg/m³/lb/hr)	WR (hourly)	Calculated Health Effects Review (lb/hr)
Normal Operations								
FUG	FUG	Site Fugitives	0.001	50	3	4375	1.89%	0.0005
REB-1	DEHY-SV	Glycol Dehy Still Vent	0.01	50	14	469	18.89%	0.04
FL-3	TK-20	Condensate Storage Tank at Baker	0.0002	50	30	43	0.38%	0.01
FL-3	TK-21	Produced Water Storage Tank at Baker	0.00001	50	30	43	0.02%	0.0005
FL-1	FL-1	Flare Combustion (normal operations assist, and pilot)	0.00001	50	30	43	0.02%	0.0005
FL-2	FL-2	Flare Combustion (normal operations assist, and pilot)	0.00001	50	30	43	0.02%	0.0005
FL-3	FL-3	Flare Combustion (normal operations waste gas, assist, and pilot)	0.0001	50	30	43	0.19%	0.005
Maintenance, Startup, and Shutdown								
COMP-01-SV	COMP-01-SV	Compressor Engine 1 Starter Vent	0.02	50	20	25	37.77%	1.63
FL-1-SMSS	COMP-01-BD	Compressor Engine 1 Blowdown	0.0002	50	30	43	0.38%	0.01
COMP-02-SV	COMP-02-SV	Compressor Engine 2 Starter Vent	0.02	50	20	25	37.77%	1.63
FL-1-SMSS	COMP-02-BD	Compressor Engine 2 Blowdown	0.0002	50	30	43	0.38%	0.01
FL-2-SMSS	TK-01 through TK-08	Controlled Condensate Tanks Emissions (during VRU downtime)	0.0004	50	30	43	0.76%	0.02
FL-2-SMSS	TK-10 through TK-19	Controlled Produced Water Tank Emissions (during VRU downtime)	0.00002	50	30	43	0.038%	0.001
FL-1-SMSS	FL-1-SMSS	Flare 1 Combustion (Engine blowdown waste gas)	0.0004	50	30	43	0.76%	0.02
FL-2-SMSS	FL-2-SMSS	Flare 2 Combustion (Tanks waste gas during VRU downtime)	0.0004	50	30	43	0.76%	0.02
	Total		**0.05**					**3.40**

Impacts Analysis:

	Hourly
Calculated H_2S Emissions (lb/hr):	0.05
Calculated H_2S Health Effects Review (lb/hr):	3.40

Per the non-Rule Oil and Gas Standard Permit (k)(4)(B), the site's air contaminant maximum predicted concentrations are less than the appropriate ESL. Therefore the impacts analysis meets the requirements of the Oil and Gas Standard Permit.

Health Effects Calculations and Impact factors G and WR, and equations from Air Quality Standard Permit for Oil and Gas Handling and Production Facilities (k) and Tables
Table 1: Emission Impact Tables Limits and Descriptions
Table 2: Fugitives and Process Vents Table
Table 3: Flares and Thermal Destruction Devices
State Property Line Standard 108 μg/m³ per 30 TAC Ch 112 and TCEQ Modeling Guidance

NOTE: Not all events shown here would occur at the same time (MSS events would not occur during normal operations events), therefore the analysis shown is conservatively represented.

02/07/13
12:26:20

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Sugarkane - Baker Dehy Unit - COMP-01

SIMPLE TERRAIN INPUTS:

```
   SOURCE TYPE              =        POINT
   EMISSION RATE (G/S)      =      .125800
   STACK HEIGHT (M)         =       6.0960
   STK INSIDE DIAM (M)      =        .3048
   STK EXIT VELOCITY (M/S)=        26.4285
   STK GAS EXIT TEMP (K)    =     802.5940
   AMBIENT AIR TEMP (K)     =     293.0000
   RECEPTOR HEIGHT (M)      =        .0000
   URBAN/RURAL OPTION       =        RURAL
   BUILDING HEIGHT (M)      =        .0000
   MIN HORIZ BLDG DIM (M)   =        .0000
   MAX HORIZ BLDG DIM (M)   =        .0000
```

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
VOLUME FLOW RATE = 4086.0000 (ACFM)

BUOY. FLUX = 3.822 M**4/S**3; MOM. FLUX = 5.922 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	64.66	1.50	1.45	NO
100.	12.18	3	10.0	10.0	3200.0	11.95	12.56	7.60	NO
200.	11.40	4	10.0	10.0	3200.0	11.95	15.65	8.66	NO
300.	10.20	4	5.0	5.0	1600.0	17.81	22.86	12.55	NO
400.	9.106	4	4.5	4.5	1440.0	19.11	29.69	15.72	NO
500.	8.007	4	3.5	3.5	1120.0	22.83	36.46	18.91	NO
600.	7.142	4	3.0	3.0	960.0	25.62	43.08	21.93	NO
700.	6.422	4	2.5	2.5	800.0	29.52	49.64	24.95	NO
800.	5.852	4	2.5	2.5	800.0	29.52	55.97	27.61	NO
900.	5.372	4	2.0	2.0	640.0	35.38	62.45	30.63	NO
1000.	4.979	4	2.0	2.0	640.0	35.38	68.64	33.17	NO
1100.	4.590	4	2.0	2.0	640.0	35.38	74.78	35.14	NO
1200.	4.262	4	1.5	1.5	480.0	45.14	81.21	37.78	NO
1300.	4.036	4	1.5	1.5	480.0	45.14	87.23	39.60	NO
1400.	4.040	5	1.0	1.0	10000.0	52.57	70.48	29.86	NO
1500.	4.078	5	1.0	1.0	10000.0	52.57	74.88	30.93	NO
1600.	4.224	6	1.0	1.0	10000.0	44.66	53.15	21.77	NO
1700.	4.379	6	1.0	1.0	10000.0	44.66	56.03	22.41	NO
1800.	4.508	6	1.0	1.0	10000.0	44.66	58.91	23.04	NO
1900.	4.614	6	1.0	1.0	10000.0	44.66	61.77	23.66	NO
2000.	4.698	6	1.0	1.0	10000.0	44.66	64.62	24.27	NO
2100.	4.727	6	1.0	1.0	10000.0	44.66	67.46	24.79	NO
2200.	4.744	6	1.0	1.0	10000.0	44.66	70.29	25.31	NO

2300.	4.749	6	1.0	1.0	10000.0	44.66	73.11	25.81	NO
2400.	4.745	6	1.0	1.0	10000.0	44.66	75.92	26.31	NO
2500.	4.733	6	1.0	1.0	10000.0	44.66	78.72	26.79	NO
2600.	4.715	6	1.0	1.0	10000.0	44.66	81.51	27.28	NO
2700.	4.690	6	1.0	1.0	10000.0	44.66	84.29	27.75	NO
2800.	4.659	6	1.0	1.0	10000.0	44.66	87.06	28.22	NO
2900.	4.625	6	1.0	1.0	10000.0	44.66	89.83	28.68	NO
3000.	4.587	6	1.0	1.0	10000.0	44.66	92.58	29.14	NO
3500.	4.309	6	1.0	1.0	10000.0	44.66	106.22	31.00	NO
4000.	4.032	6	1.0	1.0	10000.0	44.66	119.68	32.75	NO
4500.	3.768	6	1.0	1.0	10000.0	44.66	132.96	34.39	NO
5000.	3.524	6	1.0	1.0	10000.0	44.66	146.09	35.94	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

112.	12.46	3	10.0	10.0	3200.0	11.95	14.05	8.49	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	12.46	112.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

02/07/13
12:30:32

```
 ***   SCREEN3 MODEL RUN   ***
 *** VERSION DATED 96043 ***

Sugarkane - Baker Dehy Unit - COMP-02

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE              =        POINT
   EMISSION RATE (G/S)      =      .125800
   STACK HEIGHT (M)         =       6.0960
   STK INSIDE DIAM (M)      =        .3048
   STK EXIT VELOCITY (M/S)=        22.5412
   STK GAS EXIT TEMP (K)    =     730.9280
   AMBIENT AIR TEMP (K)     =     293.0000
   RECEPTOR HEIGHT (M)      =        .0000
   URBAN/RURAL OPTION       =        RURAL
   BUILDING HEIGHT (M)      =        .0000
   MIN HORIZ BLDG DIM (M) =          .0000
   MAX HORIZ BLDG DIM (M) =          .0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   STACK EXIT VELOCITY WAS CALCULATED FROM
   VOLUME FLOW RATE =    3485.0000     (ACFM)

BUOY. FLUX =     3.076 M**4/S**3;   MOM. FLUX =      4.731 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF     0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
```

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	55.86	1.39	1.34	NO
100.	14.48	3	10.0	10.0	3200.0	11.07	12.54	7.58	NO
200.	13.46	4	8.0	8.0	2560.0	12.32	15.66	8.68	NO
300.	12.28	4	5.0	5.0	1600.0	16.05	22.79	12.42	NO
400.	10.70	4	4.0	4.0	1280.0	18.54	29.67	15.68	NO
500.	9.428	4	3.0	3.0	960.0	22.68	36.46	18.90	NO
600.	8.397	4	2.5	2.5	800.0	26.00	43.09	21.96	NO
700.	7.525	4	2.5	2.5	800.0	26.00	49.52	24.70	NO
800.	6.904	4	2.0	2.0	640.0	30.98	56.03	27.71	NO
900.	6.290	4	2.0	2.0	640.0	30.98	62.29	30.31	NO
1000.	5.825	4	1.5	1.5	480.0	39.27	68.78	33.46	NO
1100.	5.441	4	1.5	1.5	480.0	39.27	74.91	35.42	NO
1200.	5.077	4	1.5	1.5	480.0	39.27	81.00	37.32	NO
1300.	4.737	4	1.5	1.5	480.0	39.27	87.04	39.17	NO
1400.	4.759	5	1.0	1.0	10000.0	49.32	70.31	29.46	NO
1500.	4.976	6	1.0	1.0	10000.0	41.97	50.09	20.74	NO
1600.	5.159	6	1.0	1.0	10000.0	41.97	52.99	21.40	NO
1700.	5.307	6	1.0	1.0	10000.0	41.97	55.89	22.04	NO
1800.	5.424	6	1.0	1.0	10000.0	41.97	58.77	22.68	NO
1900.	5.513	6	1.0	1.0	10000.0	41.97	61.64	23.31	NO
2000.	5.576	6	1.0	1.0	10000.0	41.97	64.49	23.93	NO
2100.	5.580	6	1.0	1.0	10000.0	41.97	67.34	24.46	NO
2200.	5.570	6	1.0	1.0	10000.0	41.97	70.18	24.98	NO

2300.	5.550	6	1.0	1.0	10000.0	41.97	73.00	25.49	NO
2400.	5.519	6	1.0	1.0	10000.0	41.97	75.81	25.99	NO
2500.	5.481	6	1.0	1.0	10000.0	41.97	78.62	26.49	NO
2600.	5.436	6	1.0	1.0	10000.0	41.97	81.41	26.97	NO
2700.	5.386	6	1.0	1.0	10000.0	41.97	84.20	27.46	NO
2800.	5.331	6	1.0	1.0	10000.0	41.97	86.97	27.93	NO
2900.	5.273	6	1.0	1.0	10000.0	41.97	89.74	28.40	NO
3000.	5.211	6	1.0	1.0	10000.0	41.97	92.49	28.86	NO
3500.	4.833	6	1.0	1.0	10000.0	41.97	106.15	30.74	NO
4000.	4.475	6	1.0	1.0	10000.0	41.97	119.61	32.49	NO
4500.	4.146	6	1.0	1.0	10000.0	41.97	132.90	34.15	NO
5000.	3.849	6	1.0	1.0	10000.0	41.97	146.03	35.71	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

103.	14.50	3	10.0	10.0	3200.0	11.07	13.00	7.84	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	14.50		

02/07/13
12:32:40

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Sugarkane - Baker Dehy Unit - REB-1

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	.125800
STACK HEIGHT (M)	=	4.3586
STK INSIDE DIAM (M)	=	.3175
STK EXIT VELOCITY (M/S)	=	.4465
STK GAS EXIT TEMP (K)	=	672.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	.0000
MIN HORIZ BLDG DIM (M)	=	.0000
MAX HORIZ BLDG DIM (M)	=	.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
VOLUME FLOW RATE = 74.910000 (ACFM)

BUOY. FLUX = .062 M**4/S**3; MOM. FLUX = .002 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	6.36	.45	.26	NO
100.	415.1	4	1.0	1.0	320.0	6.36	8.24	4.71	NO
200.	228.1	4	1.0	1.0	320.0	6.36	15.58	8.53	NO
300.	127.3	4	1.0	1.0	320.0	6.36	22.62	12.12	NO
400.	81.53	4	1.0	1.0	320.0	6.36	29.46	15.29	NO
500.	78.20	6	1.0	1.0	10000.0	13.46	18.18	8.85	NO
600.	76.01	6	1.0	1.0	10000.0	13.46	21.42	10.08	NO
700.	70.74	6	1.0	1.0	10000.0	13.46	24.62	11.28	NO
800.	64.38	6	1.0	1.0	10000.0	13.46	27.78	12.30	NO
900.	58.36	6	1.0	1.0	10000.0	13.46	30.90	13.28	NO
1000.	52.90	6	1.0	1.0	10000.0	13.46	34.00	14.23	NO
1100.	48.09	6	1.0	1.0	10000.0	13.46	37.07	15.08	NO
1200.	43.86	6	1.0	1.0	10000.0	13.46	40.11	15.90	NO
1300.	40.16	6	1.0	1.0	10000.0	13.46	43.13	16.71	NO
1400.	36.91	6	1.0	1.0	10000.0	13.46	46.13	17.49	NO
1500.	34.04	6	1.0	1.0	10000.0	13.46	49.11	18.25	NO
1600.	31.50	6	1.0	1.0	10000.0	13.46	52.07	18.99	NO
1700.	29.24	6	1.0	1.0	10000.0	13.46	55.01	19.71	NO
1800.	27.23	6	1.0	1.0	10000.0	13.46	57.93	20.43	NO
1900.	25.43	6	1.0	1.0	10000.0	13.46	60.84	21.12	NO
2000.	23.81	6	1.0	1.0	10000.0	13.46	63.74	21.81	NO
2100.	22.41	6	1.0	1.0	10000.0	13.46	66.62	22.39	NO
2200.	21.14	6	1.0	1.0	10000.0	13.46	69.48	22.95	NO

2300.	19.99	6	1.0	1.0	10000.0	13.46	72.33	23.51	NO
2400.	18.94	6	1.0	1.0	10000.0	13.46	75.17	24.05	NO
2500.	17.97	6	1.0	1.0	10000.0	13.46	78.00	24.58	NO
2600.	17.09	6	1.0	1.0	10000.0	13.46	80.81	25.11	NO
2700.	16.28	6	1.0	1.0	10000.0	13.46	83.62	25.62	NO
2800.	15.53	6	1.0	1.0	10000.0	13.46	86.41	26.13	NO
2900.	14.84	6	1.0	1.0	10000.0	13.46	89.19	26.63	NO
3000.	14.19	6	1.0	1.0	10000.0	13.46	91.97	27.12	NO
3500.	11.69	6	1.0	1.0	10000.0	13.46	105.69	29.11	NO
4000.	9.871	6	1.0	1.0	10000.0	13.46	119.20	30.96	NO
4500.	8.491	6	1.0	1.0	10000.0	13.46	132.53	32.69	NO
5000.	7.415	6	1.0	1.0	10000.0	13.46	145.70	34.32	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

56.	441.9	3	1.0	1.0	320.0	6.36	7.45	4.52	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	441.9		

06/28/12
15:24:54

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

Sugarkane - Baker Dehy Unit - Flare 1, 2 and 3 Pilot Gas


SIMPLE TERRAIN INPUTS:
   SOURCE TYPE              =        FLARE
   EMISSION RATE (G/S)      =      .125800
   FLARE STACK HEIGHT (M)   =       9.1440
   TOT HEAT RLS (CAL/S)     =      1356.00
   RECEPTOR HEIGHT (M)      =        .0000
   URBAN/RURAL OPTION       =        RURAL
   EFF RELEASE HEIGHT (M)   =       9.2873
   BUILDING HEIGHT (M)      =        .0000
   MIN HORIZ BLDG DIM (M)   =        .0000
   MAX HORIZ BLDG DIM (M)   =        .0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.


BUOY. FLUX =     .022 M**4/S**3;  MOM. FLUX =     .014 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
```

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	10.75	.45	.26	NO
100.	152.2	3	1.0	1.0	320.0	10.75	12.47	7.45	NO
200.	136.1	4	1.0	1.0	320.0	10.75	15.57	8.51	NO
300.	98.61	4	1.0	1.0	320.0	10.75	22.61	12.10	NO
400.	69.47	4	1.0	1.0	320.0	10.75	29.46	15.27	NO
500.	50.93	4	1.0	1.0	320.0	10.75	36.15	18.30	NO
600.	49.21	6	1.0	1.0	10000.0	16.25	21.33	9.89	NO
700.	50.41	6	1.0	1.0	10000.0	16.25	24.54	11.11	NO
800.	48.61	6	1.0	1.0	10000.0	16.25	27.71	12.14	NO
900.	45.99	6	1.0	1.0	10000.0	16.25	30.84	13.13	NO
1000.	43.07	6	1.0	1.0	10000.0	16.25	33.94	14.09	NO
1100.	40.09	6	1.0	1.0	10000.0	16.25	37.02	14.95	NO
1200.	37.28	6	1.0	1.0	10000.0	16.25	40.06	15.78	NO
1300.	34.68	6	1.0	1.0	10000.0	16.25	43.09	16.59	NO
1400.	32.29	6	1.0	1.0	10000.0	16.25	46.09	17.37	NO
1500.	30.12	6	1.0	1.0	10000.0	16.25	49.07	18.14	NO
1600.	28.14	6	1.0	1.0	10000.0	16.25	52.03	18.89	NO
1700.	26.35	6	1.0	1.0	10000.0	16.25	54.98	19.62	NO
1800.	24.72	6	1.0	1.0	10000.0	16.25	57.90	20.33	NO
1900.	23.23	6	1.0	1.0	10000.0	16.25	60.81	21.03	NO
2000.	21.88	6	1.0	1.0	10000.0	16.25	63.71	21.72	NO
2100.	20.68	6	1.0	1.0	10000.0	16.25	66.59	22.30	NO
2200.	19.59	6	1.0	1.0	10000.0	16.25	69.45	22.87	NO
2300.	18.59	6	1.0	1.0	10000.0	16.25	72.31	23.42	NO
2400.	17.67	6	1.0	1.0	10000.0	16.25	75.15	23.97	NO
2500.	16.82	6	1.0	1.0	10000.0	16.25	77.97	24.51	NO

2600.	16.04	6	1.0	1.0	10000.0	16.25	80.79	25.03	NO
2700.	15.32	6	1.0	1.0	10000.0	16.25	83.59	25.55	NO
2800.	14.65	6	1.0	1.0	10000.0	16.25	86.39	26.06	NO
2900.	14.02	6	1.0	1.0	10000.0	16.25	89.17	26.56	NO
3000.	13.44	6	1.0	1.0	10000.0	16.25	91.94	27.05	NO
3500.	11.16	6	1.0	1.0	10000.0	16.25	105.67	29.05	NO
4000.	9.469	6	1.0	1.0	10000.0	16.25	119.19	30.90	NO
4500.	8.180	6	1.0	1.0	10000.0	16.25	132.52	32.63	NO
5000.	7.169	6	1.0	1.0	10000.0	16.25	145.68	34.26	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

102.	152.3	3	1.0	1.0	320.0	10.75	12.81	7.66	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	152.3	102.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Sugarkane - Baker Dehy Unit - Flare 1, 2 AND 3 Assist Gas

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	FLARE
EMISSION RATE (G/S)	=	.125800
FLARE STACK HEIGHT (M)	=	9.1440
TOT HEAT RLS (CAL/S)	=	113048.
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	RURAL
EFF RELEASE HEIGHT (M)	=	10.3309
BUILDING HEIGHT (M)	=	.0000
MIN HORIZ BLDG DIM (M)	=	.0000
MAX HORIZ BLDG DIM (M)	=	.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 1.874 M**4/S**3; MOM. FLUX = 1.143 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	44.57	.91	.83	NO
100.	10.86	1	3.0	3.0	960.0	21.75	27.05	14.32	NO
200.	12.48	3	3.5	3.5	1120.0	20.11	23.78	14.30	NO
300.	11.65	3	2.0	2.0	640.0	27.44	34.64	20.91	NO
400.	10.91	4	3.0	3.0	960.0	21.72	29.63	15.61	NO
500.	10.30	4	2.5	2.5	800.0	23.99	36.36	18.71	NO
600.	9.635	4	2.0	2.0	640.0	27.41	43.00	21.77	NO
700.	8.887	4	1.5	1.5	480.0	33.10	49.62	24.90	NO
800.	8.375	4	1.5	1.5	480.0	33.10	55.95	27.56	NO
900.	7.752	4	1.5	1.5	480.0	33.10	62.22	30.18	NO
1000.	7.164	4	1.0	1.0	320.0	44.48	68.82	33.54	NO
1100.	6.830	4	1.0	1.0	320.0	44.48	74.95	35.49	NO
1200.	6.481	4	1.0	1.0	320.0	44.48	81.03	37.39	NO
1300.	6.134	4	1.0	1.0	320.0	44.48	87.07	39.23	NO
1400.	5.798	4	1.0	1.0	320.0	44.48	93.06	41.04	NO
1500.	5.478	4	1.0	1.0	320.0	44.48	99.02	42.80	NO
1600.	5.267	6	1.0	1.0	10000.0	40.56	52.71	20.67	NO
1700.	5.445	6	1.0	1.0	10000.0	40.56	55.61	21.34	NO
1800.	5.585	6	1.0	1.0	10000.0	40.56	58.51	22.00	NO
1900.	5.691	6	1.0	1.0	10000.0	40.56	61.39	22.65	NO
2000.	5.767	6	1.0	1.0	10000.0	40.56	64.26	23.29	NO
2100.	5.778	6	1.0	1.0	10000.0	40.56	67.11	23.83	NO
2200.	5.772	6	1.0	1.0	10000.0	40.56	69.96	24.36	NO
2300.	5.753	6	1.0	1.0	10000.0	40.56	72.79	24.89	NO
2400.	5.723	6	1.0	1.0	10000.0	40.56	75.61	25.40	NO
2500.	5.683	6	1.0	1.0	10000.0	40.56	78.42	25.91	NO

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 2600.    5.636          6     1.0     1.0 10000.0   40.56    81.23    26.40    NO
 2700.    5.583          6     1.0     1.0 10000.0   40.56    84.02    26.90    NO
 2800.    5.524          6     1.0     1.0 10000.0   40.56    86.80    27.38    NO
 2900.    5.461          6     1.0     1.0 10000.0   40.56    89.57    27.86    NO
 3000.    5.395          6     1.0     1.0 10000.0   40.56    92.33    28.33    NO
 3500.    4.991          6     1.0     1.0 10000.0   40.56   106.00    30.24    NO
 4000.    4.609          6     1.0     1.0 10000.0   40.56   119.48    32.02    NO
 4500.    4.260          6     1.0     1.0 10000.0   40.56   132.78    33.70    NO
 5000.    3.945          6     1.0     1.0 10000.0   40.56   145.93    35.28    NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
  200.   12.48           3     3.5     3.5  1120.0   20.11    23.78    14.30    NO

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION           MAX CONC     DIST TO    TERRAIN
  PROCEDURE           (UG/M**3)     MAX (M)     HT (M)
--------------      -----------    -------    -------
SIMPLE TERRAIN         12.48          200.         0.

***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
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02/07/13
12:36:38

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Sugarkane - Baker Dehy Unit - FLARE baker COND

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	FLARE
EMISSION RATE (G/S)	=	.125800
FLARE STACK HEIGHT (M)	=	9.1440
TOT HEAT RLS (CAL/S)	=	291900.
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	RURAL
EFF RELEASE HEIGHT (M)	=	11.0119
BUILDING HEIGHT (M)	=	.0000
MIN HORIZ BLDG DIM (M)	=	.0000
MAX HORIZ BLDG DIM (M)	=	.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 4.840 M**4/S**3; MOM. FLUX = 2.951 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	80.45	1.19	1.13	NO
100.	2.971	2	5.0	5.0	1600.0	24.90	19.55	11.11	NO
200.	5.650	3	8.0	8.1	2560.0	19.67	23.75	14.25	NO
300.	5.477	3	4.5	4.5	1440.0	26.40	34.57	20.80	NO
400.	4.915	3	3.0	3.0	960.0	34.09	45.13	27.26	NO
500.	4.824	4	5.0	5.1	1600.0	24.79	36.36	18.72	NO
600.	4.545	4	4.0	4.1	1280.0	28.24	43.00	21.77	NO
700.	4.258	4	3.5	3.6	1120.0	30.70	49.51	24.68	NO
800.	3.990	4	3.0	3.0	960.0	33.98	55.96	27.57	NO
900.	3.729	4	2.5	2.5	800.0	38.57	62.38	30.50	NO
1000.	3.525	4	2.5	2.5	800.0	38.57	68.58	33.05	NO
1100.	3.289	4	2.5	2.5	800.0	38.57	74.73	35.02	NO
1200.	3.110	4	2.0	2.0	640.0	45.47	81.04	37.41	NO
1300.	2.952	4	2.0	2.0	640.0	45.47	87.08	39.26	NO
1400.	2.797	4	2.0	2.0	640.0	45.47	93.07	41.06	NO
1500.	2.648	4	2.0	2.0	640.0	45.47	99.03	42.82	NO
1600.	2.592	5	1.0	1.0	10000.0	60.73	79.43	32.37	NO
1700.	2.649	5	1.0	1.0	10000.0	60.73	83.79	33.40	NO
1800.	2.689	5	1.0	1.0	10000.0	60.73	88.13	34.40	NO
1900.	2.716	5	1.0	1.0	10000.0	60.73	92.45	35.40	NO
2000.	2.731	5	1.0	1.0	10000.0	60.73	96.75	36.38	NO
2100.	2.724	5	1.0	1.0	10000.0	60.73	101.03	37.25	NO
2200.	2.711	5	1.0	1.0	10000.0	60.73	105.30	38.11	NO
2300.	2.734	6	1.0	1.1	10000.0	52.00	73.22	26.11	NO
2400.	2.779	6	1.0	1.1	10000.0	52.00	76.03	26.60	NO
2500.	2.817	6	1.0	1.1	10000.0	52.00	78.82	27.09	NO
2600.	2.848	6	1.0	1.1	10000.0	52.00	81.61	27.56	NO

2700.	2.873	6	1.0	1.1	10000.0	52.00	84.39	28.03	NO
2800.	2.893	6	1.0	1.1	10000.0	52.00	87.16	28.50	NO
2900.	2.908	6	1.0	1.1	10000.0	52.00	89.92	28.96	NO
3000.	2.919	6	1.0	1.1	10000.0	52.00	92.67	29.41	NO
3500.	2.864	6	1.0	1.1	10000.0	52.00	106.30	31.26	NO
4000.	2.775	6	1.0	1.1	10000.0	52.00	119.74	32.99	NO
4500.	2.668	6	1.0	1.1	10000.0	52.00	133.02	34.61	NO
5000.	2.555	6	1.0	1.1	10000.0	52.00	146.14	36.16	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

246.	5.697	3	5.0	5.0	1600.0	24.86	28.95	17.47	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	5.697	246.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

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 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

Sugarkane - Baker Dehy Unit- Flare Baker PW

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE             =        FLARE
   EMISSION RATE (G/S)     =      .125800
   FLARE STACK HEIGHT (M)  =       9.1440
   TOT HEAT RLS (CAL/S)    =      5600.00
   RECEPTOR HEIGHT (M)     =        .0000
   URBAN/RURAL OPTION      =        RURAL
   EFF RELEASE HEIGHT (M)  =       9.4262
   BUILDING HEIGHT (M)     =        .0000
   MIN HORIZ BLDG DIM (M)  =        .0000
   MAX HORIZ BLDG DIM (M)  =        .0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.


BUOY. FLUX =     .093 M**4/S**3;  MOM. FLUX =     .057 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
```

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	13.03	.51	.35	NO
100.	94.72	3	1.0	1.0	320.0	13.03	12.51	7.51	NO
200.	94.18	4	1.0	1.0	320.0	13.03	15.60	8.56	NO
300.	81.92	4	1.0	1.0	320.0	13.03	22.63	12.14	NO
400.	61.79	4	1.0	1.0	320.0	13.03	29.47	15.30	NO
500.	46.93	4	1.0	1.0	320.0	13.03	36.16	18.33	NO
600.	36.56	4	1.0	1.0	320.0	13.03	42.73	21.24	NO
700.	29.22	4	1.0	1.0	320.0	13.03	49.20	24.06	NO
800.	29.20	6	1.0	1.0	10000.0	20.59	27.82	12.39	NO
900.	29.55	6	1.0	1.0	10000.0	20.59	30.94	13.37	NO
1000.	29.20	6	1.0	1.0	10000.0	20.59	34.03	14.31	NO
1100.	28.29	6	1.0	1.0	10000.0	20.59	37.10	15.16	NO
1200.	27.21	6	1.0	1.0	10000.0	20.59	40.14	15.98	NO
1300.	26.03	6	1.0	1.0	10000.0	20.59	43.16	16.78	NO
1400.	24.83	6	1.0	1.0	10000.0	20.59	46.16	17.55	NO
1500.	23.65	6	1.0	1.0	10000.0	20.59	49.13	18.31	NO
1600.	22.49	6	1.0	1.0	10000.0	20.59	52.09	19.05	NO
1700.	21.39	6	1.0	1.0	10000.0	20.59	55.03	19.77	NO
1800.	20.35	6	1.0	1.0	10000.0	20.59	57.96	20.48	NO
1900.	19.36	6	1.0	1.0	10000.0	20.59	60.86	21.18	NO
2000.	18.43	6	1.0	1.0	10000.0	20.59	63.76	21.86	NO
2100.	17.58	6	1.0	1.0	10000.0	20.59	66.63	22.44	NO
2200.	16.78	6	1.0	1.0	10000.0	20.59	69.50	23.00	NO
2300.	16.03	6	1.0	1.0	10000.0	20.59	72.35	23.56	NO
2400.	15.34	6	1.0	1.0	10000.0	20.59	75.19	24.10	NO
2500.	14.69	6	1.0	1.0	10000.0	20.59	78.01	24.63	NO
2600.	14.09	6	1.0	1.0	10000.0	20.59	80.83	25.16	NO

2700.	13.52	6	1.0	1.0	10000.0	20.59	83.63	25.67	NO
2800.	12.99	6	1.0	1.0	10000.0	20.59	86.42	26.18	NO
2900.	12.49	6	1.0	1.0	10000.0	20.59	89.21	26.67	NO
3000.	12.02	6	1.0	1.0	10000.0	20.59	91.98	27.16	NO
3500.	10.12	6	1.0	1.0	10000.0	20.59	105.70	29.16	NO
4000.	8.690	6	1.0	1.0	10000.0	20.59	119.21	31.00	NO
4500.	7.573	6	1.0	1.0	10000.0	20.59	132.54	32.73	NO
5000.	6.684	6	1.0	1.0	10000.0	20.59	145.71	34.36	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

125.	103.8	3	1.0	1.0	320.0	13.03	15.46	9.25	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	103.8	125.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

02/07/13
12:40:35

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 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

Sugarkane - Baker Dehy Unit - SMSS FLARE BD

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE            =       FLARE
   EMISSION RATE (G/S)    =     .125800
   FLARE STACK HEIGHT (M) =      9.1440
   TOT HEAT RLS (CAL/S)   =     122500.
   RECEPTOR HEIGHT (M)    =       .0000
   URBAN/RURAL OPTION     =       RURAL
   EFF RELEASE HEIGHT (M) =     10.3774
   BUILDING HEIGHT (M)    =       .0000
   MIN HORIZ BLDG DIM (M) =       .0000
   MAX HORIZ BLDG DIM (M) =       .0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.


BUOY. FLUX =    2.031 M**4/S**3;  MOM. FLUX =    1.239 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
```

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	46.73	.93	.86	NO
100.	10.05	2	5.0	5.0	1600.0	17.65	19.38	10.81	NO
200.	11.72	3	3.5	3.5	1120.0	20.75	23.81	14.34	NO
300.	10.87	3	2.0	2.0	640.0	28.54	34.68	20.98	NO
400.	10.21	4	3.0	3.0	960.0	22.46	29.66	15.65	NO
500.	9.687	4	2.5	2.5	800.0	24.88	36.38	18.76	NO
600.	9.040	4	2.0	2.0	640.0	28.50	43.03	21.83	NO
700.	8.362	4	2.0	2.0	640.0	28.50	49.46	24.59	NO
800.	7.857	4	1.5	1.5	480.0	34.54	56.00	27.66	NO
900.	7.344	4	1.5	1.5	480.0	34.54	62.27	30.26	NO
1000.	6.789	4	1.5	1.5	480.0	34.54	68.48	32.83	NO
1100.	6.331	4	1.0	1.0	320.0	46.63	75.03	35.66	NO
1200.	6.048	4	1.0	1.0	320.0	46.63	81.10	37.55	NO
1300.	5.758	4	1.0	1.0	320.0	46.63	87.14	39.39	NO
1400.	5.470	4	1.0	1.0	320.0	46.63	93.13	41.18	NO
1500.	5.190	4	1.0	1.0	320.0	46.63	99.09	42.94	NO
1600.	4.924	4	1.0	1.0	320.0	46.63	105.01	44.66	NO
1700.	5.093	6	1.0	1.0	10000.0	41.40	55.65	21.43	NO
1800.	5.239	6	1.0	1.0	10000.0	41.40	58.54	22.09	NO
1900.	5.353	6	1.0	1.0	10000.0	41.40	61.42	22.74	NO
2000.	5.439	6	1.0	1.0	10000.0	41.40	64.29	23.37	NO
2100.	5.460	6	1.0	1.0	10000.0	41.40	67.14	23.91	NO
2200.	5.465	6	1.0	1.0	10000.0	41.40	69.99	24.44	NO
2300.	5.457	6	1.0	1.0	10000.0	41.40	72.82	24.97	NO
2400.	5.437	6	1.0	1.0	10000.0	41.40	75.64	25.48	NO
2500.	5.409	6	1.0	1.0	10000.0	41.40	78.45	25.98	NO
2600.	5.372	6	1.0	1.0	10000.0	41.40	81.25	26.48	NO

```
  2700.    5.328        6      1.0      1.0 10000.0   41.40    84.04    26.97    NO
  2800.    5.279        6      1.0      1.0 10000.0   41.40    86.82    27.45    NO
  2900.    5.226        6      1.0      1.0 10000.0   41.40    89.59    27.93    NO
  3000.    5.169        6      1.0      1.0 10000.0   41.40    92.35    28.40    NO
  3500.    4.803        6      1.0      1.0 10000.0   41.40   106.02    30.31    NO
  4000.    4.451        6      1.0      1.0 10000.0   41.40   119.50    32.09    NO
  4500.    4.126        6      1.0      1.0 10000.0   41.40   132.80    33.76    NO
  5000.    3.830        6      1.0      1.0 10000.0   41.40   145.94    35.34    NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND      1. M:
   200.    11.72        3      3.5      3.5  1120.0   20.75    23.81    14.34    NO

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC    DIST TO   TERRAIN
  PROCEDURE          (UG/M**3)   MAX (M)    HT (M)
--------------     -----------   -------   -------
SIMPLE TERRAIN       11.72          200.        0.

***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```

02/22/13
10:15:08

```
 ***   SCREEN3 MODEL RUN   ***
 *** VERSION DATED 96043 ***

Sugarkane - Baker Dehy Unit - SMSS Flare Sugarkane Cond

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE            =        FLARE
   EMISSION RATE (G/S)    =      .125800
   FLARE STACK HEIGHT (M) =       9.1440
   TOT HEAT RLS (CAL/S)   =      394100.
   RECEPTOR HEIGHT (M)    =        .0000
   URBAN/RURAL OPTION     =        RURAL
   EFF RELEASE HEIGHT (M) =      11.3001
   BUILDING HEIGHT (M)    =        .0000
   MIN HORIZ BLDG DIM (M) =        .0000
   MAX HORIZ BLDG DIM (M) =        .0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.


BUOY. FLUX =     6.534 M**4/S**3;  MOM. FLUX =     3.984 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF     0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
```

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	98.12	1.30	1.24	NO
100.	1.381	3	10.0	10.1	3200.0	19.95	12.59	7.66	NO
200.	4.419	3	8.0	8.1	2560.0	22.11	23.82	14.36	NO
300.	4.287	3	5.0	5.1	1600.0	28.60	34.65	20.92	NO
400.	3.913	4	8.0	8.1	2560.0	22.05	29.61	15.57	NO
500.	3.671	4	5.0	5.1	1600.0	28.49	36.48	18.94	NO
600.	3.567	4	5.0	5.1	1600.0	28.49	43.00	21.77	NO
700.	3.347	4	4.5	4.6	1440.0	30.41	49.49	24.65	NO
800.	3.139	4	4.0	4.1	1280.0	32.79	55.91	27.48	NO
900.	2.954	4	3.5	3.6	1120.0	35.86	62.28	30.29	NO
1000.	2.785	4	3.0	3.1	960.0	39.96	68.62	33.12	NO
1100.	2.612	4	3.0	3.1	960.0	39.96	74.76	35.09	NO
1200.	2.461	4	2.5	2.5	800.0	45.69	81.04	37.41	NO
1300.	2.337	4	2.5	2.5	800.0	45.69	87.07	39.25	NO
1400.	2.216	4	2.5	2.5	800.0	45.69	93.07	41.05	NO
1500.	2.099	4	2.5	2.5	800.0	45.69	99.03	42.81	NO
1600.	2.008	4	2.0	2.0	640.0	54.29	105.21	45.14	NO
1700.	2.037	5	1.0	1.0	10000.0	66.08	84.04	34.04	NO
1800.	2.091	5	1.0	1.0	10000.0	66.08	88.37	35.03	NO
1900.	2.134	5	1.0	1.0	10000.0	66.08	92.68	36.00	NO
2000.	2.166	5	1.0	1.0	10000.0	66.08	96.97	36.97	NO
2100.	2.178	5	1.0	1.0	10000.0	66.08	101.24	37.83	NO
2200.	2.184	5	1.0	1.0	10000.0	66.08	105.50	38.67	NO
2300.	2.185	5	1.0	1.0	10000.0	66.08	109.74	39.51	NO
2400.	2.180	5	1.0	1.0	10000.0	66.08	113.97	40.33	NO
2500.	2.172	5	1.0	1.0	10000.0	66.08	118.18	41.14	NO
2600.	2.171	6	1.0	1.1	10000.0	56.39	81.79	28.08	NO

SCREEN Flare Sugarkane COND

2700.	2.204	6	1.0	1.1	10000.0	56.39	84.56	28.54	NO
2800.	2.232	6	1.0	1.1	10000.0	56.39	87.32	29.00	NO
2900.	2.257	6	1.0	1.1	10000.0	56.39	90.08	29.45	NO
3000.	2.278	6	1.0	1.1	10000.0	56.39	92.82	29.89	NO
3500.	2.283	6	1.0	1.1	10000.0	56.39	106.43	31.71	NO
4000.	2.251	6	1.0	1.1	10000.0	56.39	119.86	33.42	NO
4500.	2.197	6	1.0	1.1	10000.0	56.39	133.13	35.03	NO
5000.	2.131	6	1.0	1.1	10000.0	56.39	146.24	36.55	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

218.	4.474	3	8.0	8.1	2560.0	22.11	25.86	15.55	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	4.474	218.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Sugarkane - Baker Dehy unit- SMSS Flare Sugarkane PW

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	FLARE
EMISSION RATE (G/S)	=	.125800
FLARE STACK HEIGHT (M)	=	9.1440
TOT HEAT RLS (CAL/S)	=	11200.0
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	RURAL
EFF RELEASE HEIGHT (M)	=	9.5371
BUILDING HEIGHT (M)	=	.0000
MIN HORIZ BLDG DIM (M)	=	.0000
MAX HORIZ BLDG DIM (M)	=	.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = .186 M**4/S**3; MOM. FLUX = .113 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	15.60	.56	.42	NO
100.	67.18	2	1.0	1.0	320.0	15.60	19.34	10.75	NO
200.	65.07	3	1.0	1.0	320.0	15.60	23.68	14.14	NO
300.	63.97	4	1.0	1.0	320.0	15.60	22.68	12.22	NO
400.	52.76	4	1.0	1.0	320.0	15.60	29.51	15.37	NO
500.	42.00	4	1.0	1.0	320.0	15.60	36.19	18.38	NO
600.	33.64	4	1.0	1.0	320.0	15.60	42.75	21.28	NO
700.	27.38	4	1.0	1.0	320.0	15.60	49.22	24.10	NO
800.	22.66	4	1.0	1.0	320.0	15.60	55.60	26.84	NO
900.	20.99	6	1.0	1.0	10000.0	23.61	31.04	13.59	NO
1000.	21.55	6	1.0	1.0	10000.0	23.61	34.12	14.52	NO
1100.	21.51	6	1.0	1.0	10000.0	23.61	37.18	15.36	NO
1200.	21.20	6	1.0	1.0	10000.0	23.61	40.22	16.17	NO
1300.	20.72	6	1.0	1.0	10000.0	23.61	43.23	16.95	NO
1400.	20.13	6	1.0	1.0	10000.0	23.61	46.22	17.72	NO
1500.	19.47	6	1.0	1.0	10000.0	23.61	49.19	18.47	NO
1600.	18.78	6	1.0	1.0	10000.0	23.61	52.15	19.21	NO
1700.	18.08	6	1.0	1.0	10000.0	23.61	55.09	19.93	NO
1800.	17.38	6	1.0	1.0	10000.0	23.61	58.01	20.63	NO
1900.	16.70	6	1.0	1.0	10000.0	23.61	60.91	21.32	NO
2000.	16.04	6	1.0	1.0	10000.0	23.61	63.80	22.00	NO
2100.	15.40	6	1.0	1.0	10000.0	23.61	66.68	22.57	NO
2200.	14.79	6	1.0	1.0	10000.0	23.61	69.54	23.13	NO
2300.	14.21	6	1.0	1.0	10000.0	23.61	72.39	23.68	NO
2400.	13.67	6	1.0	1.0	10000.0	23.61	75.23	24.22	NO
2500.	13.15	6	1.0	1.0	10000.0	23.61	78.05	24.75	NO
2600.	12.67	6	1.0	1.0	10000.0	23.61	80.86	25.27	NO

2700.	12.21	6	1.0	1.0	10000.0	23.61	83.67	25.79	NO
2800.	11.77	6	1.0	1.0	10000.0	23.61	86.46	26.29	NO
2900.	11.36	6	1.0	1.0	10000.0	23.61	89.24	26.79	NO
3000.	10.97	6	1.0	1.0	10000.0	23.61	92.01	27.27	NO
3500.	9.348	6	1.0	1.0	10000.0	23.61	105.73	29.26	NO
4000.	8.095	6	1.0	1.0	10000.0	23.61	119.24	31.10	NO
4500.	7.106	6	1.0	1.0	10000.0	23.61	132.56	32.82	NO
5000.	6.308	6	1.0	1.0	10000.0	23.61	145.73	34.44	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

151.	72.64	3	1.0	1.0	320.0	15.60	18.42	11.05	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	72.64	151.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

Oil and Gas Standard Permit and Permit By Rule Refined-Screening Modeling Guidelines

The modeling tables in the Oil and Gas Standard Permit and Permit by Rule (PBR) are only one tool the applicant may use to demonstrate emissions from Oil and Gas Site (OGS) located in the Barnett Shale are acceptable under the Standard Permit and PBR. The modeling performed to create the modeling tables demonstrates the Standard Permit and PBR are protective anywhere in the Barnett Shale. In order to make the demonstration, the modeling is based on reasonably conservative assumptions and modeling techniques. If the modeling tables are too conservative for a specific OGS, the applicant may use a more refined screening modeling approach to demonstrate acceptable emissions from an OGS under the Standard Permit and PBR. The following information provides the requirements and guidance if an applicant chooses to conduct the refined screening approach. The applicant should follow the approach exactly and should not modify the approach on a case-by-case basis. However, the commission could modify the modeling guidance to resolve technical issues, clarify instructions, or allow the use of other refined dispersion models.

There are two refined screening options for demonstrating acceptable emission impacts. The first is a screening approach using the SCREEN3 model and the second is a refined screening approach using Industrial Source Complex (ISC) model. It is possible, and acceptable, that some sites may utilize a combination of SCREEN3 and ISC when completing the impacts review.

SCREEN3 Model Setup Guidelines

The information contained in this section will provide guidance for applicants utilizing SCREEN3 in the protectiveness reviews for the Oil and Gas PBR and Standard Permit. If any of the conditions outlined in this guidance cannot be met, then this approach cannot be used.

Control Options

- The Regulatory default option must be selected.
- The Flat terrain choice must be used.
- Rural or urban dispersion options may be used based on the land use in the vicinity of the sources to be permitted.
- A land use analysis must be conducted to determine the majority land-use type within 3 kilometers (km) of the sources to be permitted.
- If the land-use designation is clear (about 70 percent or more of the total land-use is either urban or rural), then no further refinement is required and the model should be run with the appropriate land-use designation.
- If the land-use designation is not clear, the model should be run twice, once with each option and the higher of the two predicted concentrations should be reported.

Source Options

- Emissions can be represented as either point sources, point source using pseudo point parameters, area source, or as a flare.
- Use a point source with pseudo-point parameters for individual fugitive sources and for any sources that do not release to the atmosphere through standard stacks (such as stacks or vents with rain caps, horizontal releases).

- Use area source to characterize emissions from fugitive sources and for any sources that do not release to the atmosphere through standard stacks. The area and release height must represent sources or activities that occur at the same time and height. The ratio of length to width for the area source cannot be greater than 10:1. Multiple area sources can be used as applicable to meet area and release height restrictions.
- Flares may be modeled using the flare source type in SCREEN3 or by calculating the effective stack diameter and using the parameters listed in the ISC model setup guideline. The SCREEN3 flare option assumes an effective stack gas exit velocity (vs) of 20 m/s and an effective stack gas exit temperature (Ts) of 1,273 Kelvin, and calculates an effective stack diameter based on the heat release rate. Enclosed vapor combustion units should not be modeled with the preceding parameters but instead with stack parameters that reflect the physical characteristics of the unit.

Meteorology

- The SCREEN3 model defaults of full meteorology, 10-meter anemometer height, and regulatory mixing height are required.

Receptors

- Model receptors should be placed to meet the definitions listed in 30 TAC §106.352(b)(2), 30 TAC §106.352(k), and sections (b)(2) and (k) of the standard permit.
- The distance to the nearest receptor should be used to demonstrate compliance for the health effects analysis.
- The starting receptor for the state property line and NAAQS analyses should be placed at the nearest property line. The ending receptor should be located at a 1/4 mile, 1/2 mile, or 1 mile from a project for PBR level 1, PBR Level 2, or the standard permit, respectively.

Downwash

- Downwash is generally not applicable for OGS located in rural areas. Downwash may be appropriate for OGS that could be affected by large buildings located in urban areas. Generally, small tanks, storage sheds, and engines are not large enough to cause downwash effects and should not be considered in the analysis.

Output

- The maximum predicted concentration must be used to compare against the applicable ESL, NAAQS, or state ambient air standard.

- The following conversion factors can be used to convert 1-hour concentrations from SCREEN3 to averaging times greater than 1-hour:

Averaging Time	Multiplying Factor
3 hour	0.9
24 hour	0.4
Annual	0.08

ISC Model Setup Guidelines

The information contained in this section will provide guidance for applicants utilizing ISC in the protectiveness reviews for the Oil and Gas PBR and Standard Permits. The latest version of ISC-Prime must be used in the analysis. If any of the conditions outlined in this guidance cannot be met, then this approach cannot be used.

Control Options

- The Regulatory default option must be selected.
- The Flat terrain choice must be used.
- Plume depletion and deposition options are not allowed
- Rural or urban dispersion options may be used based on the land use in the vicinity of the sources to be permitted.
- A land use analysis must be conducted to determine the majority land-use type within 3 km of the sources to be permitted.
- If the land-use designation is clear (about 70 percent or more of the total land-use is either urban or rural), then no further refinement is required and the model should be run with the appropriate land-use designation.
- If the land-use designation is not clear, the model should be run twice, once with each option and the higher of the two predicted concentrations should be reported.

Source Options

- Emissions can be represented as either point sources, point source using pseudo point parameters, area source, or as a flare.
- Use a point source with pseudo-point parameters for individual fugitive sources and for any sources that do not release to the atmosphere through standard stacks (such as stacks or vents with rain caps, horizontal releases).
- Use area source to characterize emissions from fugitive sources and for any sources that do not release to the atmosphere through standard stacks. The area and release height must represent sources or activities that occur at the same time and height. The ratio of length to width for the area source cannot be greater than 10:1. Multiple area sources can be used as applicable to meet area and release height restrictions.

- Flares should be modeled with the following parameters: effective stack exit velocity of 20 meters per second; effective stack exit temperature of 1273 Kelvin; actual height of the flare tip. The effective stack diameter (in meters) should be calculated using the following equation: $D = \sqrt{(10\text{-}6qn)}$ and $qn = q(1 - 0.048\sqrt{MW})$ Where: q = gross heat release in cal/sec; qn = net heat release in cal/sec; and MW = weighted (by volume) average molecular weight of the compound being flared.

Meteorology

- The ADMT prepared meteorological data sets available at www.tceq.state.tx.us/permitting/air/modeling/admtmet.html must be used in the modeling analysis.
- The following table lists the meteorological data sets that should be used for projects located in the corresponding County

Counties	Surface Data	Upper-air Data
Cooke, Dallas, Denton, Ellis, Hood, Johnson, Parker, Somervell, Tarrant, Wise	Dallas-Fort Worth	Stephenville
Archer, Clay, Montague	Wichita Falls	Stephenville
Bosque, Coryell, Hill	Waco	Stephenville
Comanche, Hamilton	San Angelo	Stephenville
Eastland, Erath, Jack, Palo Pinto, Shackelford, Stephens	Abilene	Stephenville

- The required year is 1988 when using one year of meteorology data,
- Only one year of data is required. However, the entire five year data set may be used for NAAQS pollutants.
- The actual anemometer height must be used for each airport location. Anemometer heights can be found at the following URL: www.tceq.state.tx.us/assets/public/permitting/air/memos/anemom96.pdf

Receptors

- Model receptors should be placed to meet the definitions listed in 30 TAC §106.352(b)(2), 30 TAC §106.352(k), and sections (b)(2) and (k) of the standard permit.
- Model receptors should be placed at all locations defined as a receptor within a 1/4 mile, 1/2 mile, or 1 mile from a project for PBR level 1, PBR Level 2, or the standard permit, respectively, to demonstrate compliance with the health effects analysis.
- In addition to meeting the requirements in 30 TAC §106.352(b)(2), 30 TAC §106.352(k), and sections (b)(2) and (k) of the standard permit, the following

receptor grid design should be used when conducting a NAAQS or state property line analysis:

PBR Level 1

- Tight receptors - receptors beginning at the property line and spaced 50 feet apart extending out to a distance of 1/4 mile (1320 feet) from the property line

PBR Level 2

- Tight receptors - receptors beginning at the property line and spaced 50 feet apart extending out to a distance of 1/4 mile (1320 feet) from the property line
- Fine receptors - receptors spaced 300 feet apart beginning at 1/4 mile (1320 feet) from the property line and extending out to a distance of 1/2 mile (2640 feet) from the property line

Standard Permit

- Tight receptors - receptors beginning at the property line and spaced 50 feet apart extending out to a distance of 1/4 mile (1320 feet) from the property line
- Fine receptors - receptors spaced 300 feet apart beginning at 1/4 mile (1320 feet) from the property line and extending out to a distance of 1/2 mile (2640 feet) from the property line
- Medium receptors - receptors spaced 1500 feet apart beginning at 1/2 mile (2640 feet) from the property line and extending out to a distance of extending out to a distance of 1 mile (5280 feet)

Downwash

- Downwash is generally not applicable for OGS located in rural areas. Downwash may be appropriate for OGS that could be affected by large buildings located in urban areas. Generally, small tanks, storage sheds, and engines are not large enough to cause downwash effects and should not be considered in the analysis.
- The latest version of BPIP-Prime should be used to calculate downwash parameters if downwash is appropriate.

Coordinate System

- Enter receptor locations, source locations, and building location (if necessary) in UTM coordinates
- UTM coordinates in datum NAD27 or NAD83 must be used. Make certain that all of the coordinates originated in, or are converted to, the same horizontal datum. Applicable UTM zone for the Barnett Shale is zone 14 (between 102 and 96 degrees longitude).
- Coordinate systems based on plant coordinates, applicant-developed coordinate systems, or polar grids will not be accepted.

Output

- The maximum predicted concentration must be used to compare against the applicable ESL, NAAQS, or state ambient air standard when using one year of meteorological data.
- The *high*, second high may be used when modeling with 5 years of meteorology data for the SO_2 3-hr, SO_2 24-hr, SO_2 annual, and NO_2 annual NAAQS.
- The form of the standard may be used be used when modeling with 5 years of meteorology data for the SO_2 and NO_2 1-hr NAAQS.
- The modeling form of the standard for the 1-hr NO_2 NAAQS is based on the 5-year average of the annual 98th percentile of the daily maximum 1-hour concentrations.
- The modeling form of the standard for the 1-hr SO_2 is based on the 5-year average of the annual 99th percentile of the daily maximum 1-hour concentrations.

Review Type Guidelines

The following section contains the required procedures necessary to complete a health effects, NAAQS, and state property line evaluations. The applicant should follow the steps exactly and should not modify the approach on a case-by-case basis. However, the commission could modify the guidance to resolve technical issues, clarify instructions, or allow the use of more refined models.

In addition to following the approaches below, the evaluations must meet the requirements listed in 30 TAC §106.352(k) and section (k) of the standard permit, as appropriate.

Health Effects Analysis

- Compliance with the hourly ESL for benzene and annual ESL for benzene must be demonstrated at receptors within 1/4 mile, 1/2 mile, or 1 mile of a project for PBR Level 1, PBR Level 2, or the standard permit, respectively
- Model all new and modified sources -- the project.
- If the project's air contaminant maximum predicted concentration is equal to or less than 10% of the appropriate ESL, no further review is required.
- If a project's air contaminant maximum predicted concentration is greater than 10% of the appropriate ESL, compare the project's air contaminant maximum predicted concentration combined with project increases for that contaminant over a 60-month period to 25% of the appropriate ESL. If the resulting concentration is less than 25% of the appropriate ESL, no further review is required.
- A site wide analysis, including all sources emitting the regulated contaminant, must be conducted if the above requirements are not met. Multiple scenarios may be necessary to represent sources that may not operate simultaneously.
- All sources must be modeled at the maximum allowable emission rate.
- The maximum predicted concentration at each receptor should be compared to the ESL and included in the modeling report.

State Property Line Analysis

- Compliance with the state ambient air standard for SO_2 and H_2S must be demonstrated at any property line within 1/4 mile, 1/2 mile, or 1 mile of a project for PBR level 1, PBR Level 2, or the standard permit, respectively
- Model all new and modified sources-- the project.
- Compare the maximum predicted concentration from the project to the appropriate de minimis level. Compliance with the state property line standards is demonstrated if the maximum predicted concentration from the project is less than or equal to de minimis listed in the following table:

Pollutant	Averaging Time	Location	De Minimis (µg/m^3)
SO_2	1-hr	All locations	20
H_2S	1-hr	If property is residential, recreational, business, or commercial	2
H_2S	1-hr	If property is other than residential, recreational, business, or commercial	3

- If the maximum predicted concentration from the project is greater than de minimis, a site wide analysis must be conducted.
- Model the allowable emission rate of all sources on site that emit the regulated pollutant.
- Compliance with the state property line standard is demonstrated if the maximum predicted site-wide concentration is less than or equal to the state property line standards listed in the following table:

Pollutant	Averaging Time	Location	State Property Line Standard (µg/m^3)
SO_2	1-hr	All Locations	1021
H_2S	1-hr	If property is residential, recreational, business, or commercial	108
H_2S	1-hr	If property is other than residential, recreational, business, or commercial	162

NAAQS Analysis

- Compliance with federal ambient air standards for NO_2 and SO_2 must be demonstrated at any property line within 1/4 mile, 1/2 mile, or 1 mile of a project for PBR Level 1, PBR Level 2, or the standard permit, respectively
- Model all new and modified sources-- the project.
- Compare the maximum predicted concentration from the project to the appropriate de minimis level. Compliance with the NAAQS is demonstrated if the maximum predicted concentration from the project is less than or equal to the de minimis level listed in the following table:

Pollutant	Averaging Time	De Minimis ($\mu g/m^3$)
SO_2	1-hr	7.8
SO_2	3-hr	25
SO_2	24-hr	5
SO_2	Annual	1
NO_2	1-hr	7.5
NO_2	Annual	1

- If the maximum predicted concentration from the project is greater than de minimis, a site wide analysis must be conducted.
- Model the allowable emission rate of all sources on site that emit the regulated pollutant
- The maximum predicted concentration must be used when modeling with one year of meteorology data.
- The *high*, second high may be used when modeling with 5 years of meteorology data for the SO_2 3-hr, SO_2 24-hr, SO2 annual, and NO_2 annual NAAQS.
- The form of the standard may be used be used when modeling with 5 years of meteorology data for the SO_2 and NO_2 1-hr NAAQS.

- Add a background concentration to the predicted site wide concentration and compare the total concentration to the NAAQS. Compliance with the NAAQS is demonstrated if the total concentration is less than NAAQS listed in the following table:

Pollutant	Averaging Time	NAAQS (μg/m^3)
SO_2	1-hr	196
SO_2	3-hr	1300
SO_2	24-hr	365
SO_2	Annual	80
NO_2	1-hr	188
NO_2	Annual	100

- Screening background concentration values can be found at www.tceq.texas.gov/permitting/air/memos/interim_guidance_naaqs.html
- If the screening background concentration values are too conservative, contact the Air Dispersion Modeling Team at 512-239-1250 for further guidance. The applicant should be prepared to present and discuss alternative background concentrations.

Streamlining Techniques

The following section contains approaches that may be used to streamline the modeling required to demonstrate compliance with the health effects, NAAQS, or state property line analysis. The streamlining techniques are **NOT** required, but may be used to streamline the analyses.

Controlling Concentrations

Short-term standards are usually the controlling concentrations; that is, if the standard is met for the shortest time period, standards for longer averaging periods will also be met. Therefore, if the predicted concentrations from the maximum 1-hour emissions for a NAAQS or applicable state standard are at or lower than the concentrations from a longer averaging period, the demonstration is complete. For example, if the predicted 1-hour SO_2 concentration is 150 μg/m^3, the demonstration for all SO_2 NAAQS and state standards except the annual NAAQS is complete. However, the screening conversion factor of 0.08 can be used to convert the hourly concentration to an annual concentration, and in this case, the annual NAAQS will not be exceeded. Document the use of this technique in the modeling report.

Collocation of Emission Points

Collocating stacks may be appropriate for both screening and refined analyses if the individual emission points emit the same pollutant(s); have stack heights, volumetric flow rates, or stack gas exit temperatures that do not differ by more than about 20 percent; and are within about 100 meters of each other.

- Use the following equation to determine the worst-case stack: $M = (h_s\ V\ T_s)/Q$
- Where:
  - M = a parameter that accounts for the relative influence of stack height, plume rise, and emission rate on concentrations;
  - h_s = the physical stack height in meters;
  - $V = (\pi/4)d^2v_s$ = the stack gas flow rate in cubic meters per second.
  - Π = pi
  - d = inside stack diameter in meters;
  - v_s = stack gas exit velocity in meters per second;
  - T_s = the stack gas exit temperature in Kelvin;
  - Q = pollutant emission rate in grams per second.
- The stack that has the lowest value of M is used as a representative stack.
- The sum of the emissions from all stacks is assumed to be emitted from the representative stack.

Generic Modeling Approach

This technique uses a unit emission rate (1 pound per hour) to determine if the maximum contribution from each permitted source when added together, independent of time and space, could exceed a standard or ESL. This is a conservative procedure since the maximum concentration from all sources modeled concurrently cannot be more than the sum of the maximum concentration from each source modeled separately.

- Determine a generic impact for each source by modeling each source with a unit emission rate of 1 pound per hour; the source's actual location; and the source's proposed stack parameters represented in the permit application.
- In ISC this is done by setting up a separate source group for each source.
- The SCREEN3 model can also be used for this demonstration with a separate SCREEN3 model run for each source.
- Multiply the predicted generic impact by the proposed pollutant specific emission rate for each source to calculate a maximum predicted concentration for each source.
- Sum the maximum predicted concentration for each source to get a total predicted concentration for each pollutant.
- The sum of the maximum concentrations (for each pollutant, independent of time and space) is then compared with the threshold of concern for each pollutant.

Reporting Requirements

Once the modeling exercise is complete, the modeling approach and results should be summarized in a modeling report. The modeling report should be sent to the TCEQ permit reviewer and include a CD with all modeling input files, plot files, output files and all other files of supporting information used in the modeling demonstration.

Interim 1-Hour NO_2 Screening Background Concentrations in micrograms per cubic meter (µg/m³)[1]			
Region / Specific County[2]	Screening Background	Region / Specific County	Screening Background
1	70	10	70
		Jefferson	90
		Orange	70
2	70		
3	70	11	70
		Travis	85
4	70	12	70
Dallas	104	Brazoria	75
Ellis	85	Galveston	75
Tarrant	107	Harris	120
		Montgomery	75
5	70	13	70
Titus	90	Bexar	100
Rusk	90		
6	70	14	70
El Paso	124	Nueces	90
7	70	15	70
		Hildalgo	100
8	70	16	70
		Webb	100
9	70		
Freestone	90		
Limestone	90		

These values are conservative and based on available ambient monitoring design values (2007-2009) and may change as more research is conducted and/or data obtained.

If a value is too conservative, contact the Air Dispersion Modeling Team to determine if a more refined background concentration is available.

[1] Use the value for the region the project will be located in, or county if listed

[2] NAAQS in 188 µg/m³ converted from parts per billion based on standard temperature and pressure

Texas Natural Resource Conservation Commission

INTEROFFICE MEMORANDUM

TO: NSRPD Staff **DATE:** August 3, 1998

FROM: Dom Ruggeri, Team Leader
Air Dispersion Modeling Team (ADMT)

SUBJECT: Modeling Guidance for Exemption 106.512 (Formerly SE 6)

If an applicant meets the general requirements to claim an exemption under this rule, the applicant must demonstrate that emissions from an exempted source will not cause or contribute to a violation of the NO_2 NAAQS [106.512(6)]. One of the methods to show compliance with the NO_2 NAAQS involves dispersion modeling [106.512(6)(A)]. The applicant can use the following procedure to conduct the modeling demonstration:

Step 1. *Determine the long-term hourly emission rate for each source.*
Use the applicable NO_2/NO_x ratio in Figure 1: 30 TAC §106.512(6)(A) to adjust the hourly rate for each source.

Step 2. *Determine if the NO_2 de minimis is exceeded.*
Use EPA's SCREEN3 or ISCST3 model to determine if the new or modified sources' emissions will exceed the NO_2 de minimis of 1 $\mu g/m^3$. If the predicted concentration is $\leq$ 1 $\mu g/m^3$, the demonstration is complete. If not, go to Step 3.

Step 3. *Determine the background concentration from the Screening Background Concentrations table (attached).* If the predicted concentration plus background is $\leq$ 100 $\mu g/m^3$, the demonstration is complete. If not, a full state NAAQS analysis may be required if the screening background concentration cannot be refined to a more representative value. Go to Step 4.

Step 4. *Determine if there is a NO_2 monitor in the county.* If not, go to Step 5.
Obtain a background concentration from a representative monitor in the county. Use the most recent annual concentration from the Aerometric Information Retrieval System (AIRS) [www.epa.gov/airsweb/monreps.htm] that is based on at least 6570 hours of observations.

Convert the concentration from ppm to $\mu g/m^3$ by multiplying the AIRS concentration by 1887. If the predicted concentration plus the monitored background concentration is $\leq$ 100 $\mu g/m^3$, the demonstration is complete. If not, a full state NAAQS analysis may be required. Contact the ADMT staff for modeling guidance.

Step 5. *Contact the ADMT staff for assistance in developing a representative background concentration.* If the predicted concentration plus a representative background concentration is $\leq$ 100 $\mu g/m^3$, the demonstration is complete. If not, a full state NAAQS analysis may be required. Contact the ADMT staff for modeling guidance.

Attachment

SCREENING BACKGROUND CONCENTRATIONS
NO_2
August, 1998

Note: Use regional values unless concentrations for a specific county are provided.

Regional Background / Specific County Background - Annual Concentration ($\mu g/m^3$)							
Region 1 20	Region 2 20	Region3 20	Region 4 20	Region 5 20	Region 6 20	Region 7 20	Region 8 20
Potter 25	Lubbock 25	Wichita 25	Collin 25	Rusk 30	El Paso 70	Ector 35	
			Dallas 55	Smith 25			
			Denton 25	Titus 30			
			Ellis 25				
			Tarrant 40				

Regional Background / Specific County Background - Annual Concentration ($\mu g/m^3$)							
Region 9 20	Region 10 20	Region 11 20	Region 12 20	Region 13 20	Region 14 20	Region 15 20	Region 16 20
Bell 40	Jefferson 35	Fayette 30	Brazoria 35	Bexar 50	Nueces 35	Cameron 30	Webb 25
Limestone 25	Orange 35	Travis 45	Chambers 25		Victoria 25	Hidalgo 30	
McLennan 30		Williamson 25	Ft. Bend 35				
Robertson 35			Galveston 30				
			Harris 60				
			Montgomery 25				

ATTACHMENT 6
SUPPORTING DOCUMENTATION

OIL AND GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB – BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Description **Page**

Facility/Compound Specific Fugitive Emission Factors

Equipment/ Service	Ethylene Oxide [1]	Phosgene [2]	Butadiene [3]	Petroleum Marketing Terminal [4]	Oil and Gas Production Operations [5]				Refinery [6]
					Gas	Heavy Oil <20° API	Light Oil >20°	Water/Light Oil	
Valves					0.00992	0.0000185	0.0055	0.000216	
Gas/Vapor	0.000444	0.00000216	0.001105	0.0000287					0.059
Light Liquid	0.00055	0.00000199	0.00314	0.0000948					0.024
Heavy Liquid				0.0000948					0.00051
Pumps	0.042651	0.0000201	0.05634		0.00529	0.00113 [10]	0.02866	0.000052	
Light Liquid				0.00119					0.251
Heavy Liquid				0.00119					0.046
Flanges/Connectors	0.000555	0.00000011	0.000307		0.00086	0.00000086	0.000243	0.000006	0.00055
Gas/Vapor				0.000092604					
Light Liquid				0.00001762					
Heavy Liquid				0.0000176					
Compressors	0.000767		0.000004		0.0194	0.0000683	0.0165	0.0309	1.399
Relief Valve	0.000165	0.0000162	0.02996		0.0194	0.0000683	0.0165	0.0309	0.35
Open-ended Lines [7]	0.001078	0.00000007	0.00012		0.00441	0.000309	0.00309	0.00055	0.0051
Sampling	0.000088		0.00012						0.033
Connectors					0.00044	0.0000165	0.000463	0.000243	
Other [9]					0.0194	0.0000683	0.0165	0.0309	
Gas/Vapor				0.000265					
Light/Heavy Liquid				0.000287					
Process Drains					0.0194	0.0000683	0.0165	0.0309	0.07

Table Notes: All factors are in units of (lb/hr)/component.

1. Monitoring must occur at a leak definition of 500 ppmv. No additional control credit can be applied to these factors. Emission factors are from EOIC Fugitive Emission Study, Summer 1988.

2. Monitoring must occur at a leak definition of 50 ppmv. No additional control credit can be applied to these factors. Emission factors are from Phosgene Panel Study, Summer 1988.

3. Monitoring must occur at a leak definition of 100 ppmv. No additional control credit can be applied to these factors. Emission factors are from Randall, J. L., et al., Radian Corporation. Fugitive Emissions from the 1,3-butadiene Production Industry: A Field Study. Final Report. Prepared for the 1,3-Butadiene Panel of the Chemical Manufacturers Association. April 1989.

4. Control credit is included in the factor; no additional control credit can be applied to these factors. Monthly AVO inspection required.

5. Factors give the total organic compound emission rate. Multiply by the weight percent of non-methane, non-ethane organics to get the VOC emission rate.

6. Factors are taken from EPA Document EPA-453/R-95-017, November 1995, Page 2-13.

7. The 28 Series quarterly LDAR programs require open-ended lines to equipped with a cap, blind flange, plug, or a second valve. If so equipped, open-ended lines may be given a 100% control credit.

8. Emission factor for Sampling Connections is in terms of pounds per hour per sample taken.

9. For Petroleum Marketing Terminals"Other" includes any component excluding fittings, pumps, and valves. For Oil and Gas Production Operations, "Other" includes diaphragms, dump arms, hatches, instruments, meters, polished rods, and vents.

10. No Heavy Oil - Pump factor was derived during the API study. The factor is the SOCMI without C_2 Heavy Liquid - Pump factor with a 93% reduction credit for the physical inspection.

Tank Truck Loading of Crude Oil or Condensate

Scope: Tank Truck Loading activities at loading terminals

The transportation and marketing of petroleum liquids involve many distinct operations, each of which represents a potential source of evaporation loss. Crude oil or condensate is transported from oil and gas sites to a refinery or other refining operations by tankers, barges, rail tank cars, tank trucks, and pipelines.

Loading losses are the primary source of evaporative emissions from rail tank car, tank truck, and marine vessel operations (for marine loading please review Marine Loading of Crude Oil and Condensate Guidance Document). Loading losses occur as organic vapors in "empty" cargo tanks are displaced to the atmosphere by the liquid being loaded into the tanks. These vapors are a composite of (1) vapors formed in the empty tank by evaporation of residual product from previous loads, (2) vapors transferred to the tank in vapor balance systems as product is being unloaded, and (3) vapors generated in the tank as the new product is being loaded. The quantity of evaporative losses from loading operations is, therefore, a function of the following parameters:

- Physical and chemical characteristics of the previous cargo;
- Method of unloading the previous cargo;
- Operations to transport the empty carrier to a loading terminal;
- Method of loading the new cargo; and
- Physical and chemical characteristics of the new cargo.

Tank truck loading operations can be divided into three general categories: A) atmospheric trucks, B) pressure trucks used in atmospheric service, and C) pressure trucks. The type of connection that is used in the loading procedure will be considered to determine the collection efficiency. "Quick connects" are clamp type connections that are not bolted or flanged. "Quick connects" can be used with atmospheric trucks. Hard-piped connections are bolted or flanged to the receiving vessel. Hard-piped connections should be used with pressure trucks to achieve its maximum collection efficiency. Atmospheric trucks must be leak checked according to NSPS Subpart XX to achieve its maximum collection efficiency.

Tank Truck Loading Authorizations

All stationary facilities, or groups of facilities, at a site which handle gases and liquids associated with the production, conditioning, processing, and pipeline transfer of fluids or gases found in geologic formations on or beneath the earth's surface including, but not limited to, crude oil, natural gas, condensate, and produced water that satisfy the general conditions of Title 30, Texas Administrative Code (30 TAC), Section 106.4, and the specific conditions of 30 TAC Section 106.352 are permitted by rule. The commission also has available rule language in an easy-to-read format for the permit by rule.

For all new projects and dependent facilities not located in the Barnett Shale counties, the current 106.352 subsection (l) is applicable, which contains the previous requirements of 106.352.

For projects located in one of the Barnett Shale counties which are constructed or modified on or after April 1, 2011 subsections (a)-(k) apply.

Other permit by rules which may be used for tank truck loading but are not commonly seen are 106.261, 106.262, 106.472, and 106.473.

If a site does not qualify for a PBR, it may be authorized by a standard permit. Sites constructed prior to April 1, 2011 may be authorized using the Oil and Gas Standard Permit (30 TAC 116.620, effective January 11, 2000). For sites in one of the Barnett Shale counties constructed or modified on or after April 1, 2011, the site is subject to the requirements of the Air Quality Standard Permit for Oil and Gas Handling and Production Facilities.

Emission Calculations

Loading calculations are listed in AP-42, Chapter 5, Section 5.2: Transportation and Marketing of Petroleum Liquids.

Submerged tank truck loading is the minimum level of control required. The two types of submerge loading are the submerged fill pipe method and the bottom loading method. In the submerged fill pipe method, the fill pipe extends almost to the bottom of the cargo tank. In the bottom loading method, a permanent fill pipe is attached to the cargo tank bottom. During most of submerged loading by both methods, the fill pipe opening is below the liquid surface level. Liquid turbulence is controlled significantly during submerged loading, resulting in much lower vapor generation than encountered during splash loading.

The saturation factor, S, represents the expelled vapor's fractional approach to saturation, and it accounts for the variations observed in emission rates from the different unloading and loading methods. The loading calculation requires the use of a Saturation Factor (S factor) listed in Table 5.2-1, Saturation (S) Factors for Calculating Petroleum Liquid Loading Losses.

Submerged loading: dedicated normal service, S factor = 0.6

The S factor of 0.6 should be used if the tank truck is in "dedicated normal service". Dedicated normal service means the tank truck is used to transport only one product or products with similar characteristics (petroleum products with similar API gravity, molecular weight, vapor pressure).

Submerged Loading: dedicated vapor balance, S factor = 1.0

The S factor of 1.0 should be used if the loading vapors are returned back to the tank truck when it is unloaded to a storage tank or other vessel.

Emissions from loading petroleum liquid can be estimated using the following expression:

Where:

$$L_L = 12.46 \frac{SPM}{T}$$

- LL= loading loss, pounds per 1000 gallons (lb/103 gal) of liquid loaded
- S = a saturation factor (see Table 5.2-1)

- P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia) (see Section 7.1, "Organic Liquid Storage Tanks")
- M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole) (see Section 7.1, "Organic Liquid Storage Tanks")
- T = temperature of bulk liquid loaded, °R (°F + 460)

Emissions are broken down into short-term emissions (lb/hr) and annual emissions (tons/year). Short-term emissions should be estimated by using the maximum expected vapor pressure and temperature of the compound being loaded and the maximum expected pumping rate being used to fill the container (loading tank truck). Annual emissions should be estimated by using the average annual temperature and corresponding vapor pressure of the compound and the expected annual throughput of the compound.

Capture/Collection techniques and efficiency

The overall reduction efficiency should account for the capture efficiency of the collection system as well as both the control efficiency and any downtime of the control device. Measures to reduce loading emissions include selection of alternate loading methods and application of vapor recovery equipment.

Please note,not all of the displaced vapors reach the control device, because of leakage from both the tank truck and collection system. The collection efficiency should be assumed to be 98.7 percent for tanker trucks passing an annual leak test per EPA standards. A collection efficiency of 70 percent should be assumed for trucks which are not leak tested.

- 70% capture/collection efficiency if not leak tested
- 98.7% capture/collection efficiency if leak tested based on EPA standards (NSPS Subpart XX)
- 100% capture/collection efficiency if a blower system is installed which will produce a vacuum in the tank truck during all loading operations. A pressure/vacuum gauge shall be installed on the suction side of the loading rack blower system adjacent to the truck being loaded to verify a vacuum in that vessel. Loading shall not occur unless there is a vacuum of at least 1.5 inch water column being maintained by the vacuum-assist vapor collection system when loading trucks. The vacuum shall be recorded every 15 minutes during loading.

Uncollected Loading Emissions

Uncollected loading emissions are referred to as loading fugitives and are listed as a separate emission point or source. Uncollected loading emissions (LLF) can be estimated using the following expression:

$$L_{LF} = (L_L)\ \frac{(1 - \text{Collection Efficiency})}{100}$$

Control techniques and control efficiencies

Emissions from controlled loading operations can be calculated by multiplying the uncontrolled emission rate calculated in the loading loss equation (LL) by an overall reduction efficiency term:

$$\text{Emissions} = (L_L)\left(\frac{\text{Collection Efficiency}}{100}\right)\left(1 - \frac{\text{Control Efficiency}}{100}\right)$$

- Flares – Flares must meet 40 CFR 60.18 requirements of minimum heating value of waste gas and a maximum flare tip velocity. Flares can have a control efficiency of 98% or 99% for the following compounds: methanol, ethanol, propanol, ethylene oxide, and propylene oxide. The agency highly encourages the consideration of variable speed blowers when a control efficiency of > 98% is claimed for a steam – assisted flare to reduce over steaming of the flare which could affect the control efficiency.
- Thermal oxidizers – must be designed for the variability of the waste gas stream and basic monitoring which consists of thermocouple or infrared monitor that indicates the device is working. Control efficiencies range from 95% - <99%.
- Carbon Systems – Can claim up to a 98% control efficiency. The carbon system must have an alarm system that will prevent break through.
- Vapor Recovery Units (VRU) – Can claim up to 100% control. Designed systems claiming 100% control must submit the requirements found in the Vapor Recovery Unit Capture/Control Guidance.

Note: Loading cannot occur while the control system is off-line.

Vapor balancing is NOT a form of control; it is only a capture technique.

Flare Emission Factors

The usual flare destruction efficiencies and emission factors are provided in Table 4. The high-Btu waste streams referred to in the table have a heating value greater than 1,000 Btu/scf.

Flare Destruction Efficiencies

Claims for destruction efficiencies greater than those listed in Table 4 will be considered on a case-by-case basis. The applicant may make one of the three following demonstrations to justify the higher destruction efficiency: (1) general method, (2) 99.5 percent justification, or (3) flare stack sampling.

Table 4. Flare Factors

Waste Stream	**Destruction/Removal Efficiency (DRE)**		
VOC	98 percent (generic)		
	99 percent for compounds containing no more than 3 carbons that contain no elements other than carbon and hydrogen in addition to the following compounds: methanol, ethanol, propanol, ethylene oxide and propylene oxide		
H_2S	98 percent		
NH_3	case by case		
CO	case by case		
Air Contaminants	**Emission Factors**		
thermal NO_x	steam-assist:	high Btu	0.0485 lb/MMBtu
		low Btu	0.068 lb/MMBtu
	other:	high Btu	0.138 lb/MMBtu
		low Btu	0.0641 lb/MMBtu
fuel NO_x	NO_x is 0.5 wt percent of inlet NH_3, other fuels case by case		
CO	steam-assist:	high Btu	0.3503 lb/MMBtu
		low Btu	0.3465 lb/MMBtu
	other:	high Btu	0.2755 lb/MMBtu
		low Btu	0.5496 lb/MMBtu
PM	none, required to be smokeless		
SO_2	100 percent S in fuel to SO_2		

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-54)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	4.08 E+00	B
NO_x[c] <90% Load	8.47 E-01	B
CO[c] 90 - 105% Load	3.17 E-01	C
CO[c] <90% Load	5.57 E-01	B
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	1.47 E+00	A
Methane[g]	1.25 E+00	C
VOC[h]	1.18 E-01	C
PM10 (filterable)[i]	7.71 E-05	D
PM2.5 (filterable)[i]	7.71 E-05	D
PM Condensable[j]	9.91 E-03	D
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[k]	<4.00 E-05	E
1,1,2-Trichloroethane[k]	<3.18 E-05	E
1,1-Dichloroethane	<2.36 E-05	E
1,2,3-Trimethylbenzene	2.30 E-05	D
1,2,4-Trimethylbenzene	1.43 E-05	C
1,2-Dichloroethane	<2.36 E-05	E
1,2-Dichloropropane	<2.69 E-05	E
1,3,5-Trimethylbenzene	3.38 E-05	D
1,3-Butadiene[k]	2.67E-04	D
1,3-Dichloropropene[k]	<2.64 E-05	E
2-Methylnaphthalene[k]	3.32 E-05	C
2,2,4-Trimethylpentane[k]	2.50 E-04	C
Acenaphthene[k]	1.25 E-06	C

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES (Continued)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Acenaphthylene[k]	5.53 E-06	C
Acetaldehyde[k,l]	8.36 E-03	A
Acrolein[k,l]	5.14 E-03	A
Benzene[k]	4.40 E-04	A
Benzo(b)fluoranthene[k]	1.66 E-07	D
Benzo(e)pyrene[k]	4.15 E-07	D
Benzo(g,h,i)perylene[k]	4.14 E-07	D
Biphenyl[k]	2.12 E-04	D
Butane	5.41 E-04	D
Butyr/Isobutyraldehyde	1.01 E-04	C
Carbon Tetrachloride[k]	<3.67 E-05	E
Chlorobenzene[k]	<3.04 E-05	E
Chloroethane	1.87 E-06	D
Chloroform[k]	<2.85 E-05	E
Chrysene[k]	6.93 E-07	C
Cyclopentane	2.27 E-04	C
Ethane	1.05 E-01	C
Ethylbenzene[k]	3.97 E-05	B
Ethylene Dibromide[k]	<4.43 E-05	E
Fluoranthene[k]	1.11 E-06	C
Fluorene[k]	5.67 E-06	C
Formaldehyde[k,l]	5.28 E-02	A
Methanol[k]	2.50 E-03	B
Methylcyclohexane	1.23 E-03	C
Methylene Chloride[k]	2.00 E-05	C
n-Hexane[k]	1.11 E-03	C
n-Nonane	1.10 E-04	C

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES
(Continued)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
n-Octane	3.51 E-04	C
n-Pentane	2.60 E-03	C
Naphthalene[k]	7.44 E-05	C
PAH[k]	2.69 E-05	D
Phenanthrene[k]	1.04 E-05	D
Phenol[k]	2.40 E-05	D
Propane	4.19 E-02	C
Pyrene[k]	1.36 E-06	C
Styrene[k]	<2.36 E-05	E
Tetrachloroethane[k]	2.48 E-06	D
Toluene[k]	4.08 E-04	B
Vinyl Chloride[k]	1.49 E-05	C
Xylene[k]	1.84 E-04	B

[a] Reference 7. Factors represent uncontrolled levels. For NO_x, CO, and PM10, "uncontrolled" means no combustion or add-on controls; however, the factor may include turbocharged units. For all other pollutants, "uncontrolled" means no oxidation control; the data set may include units with control techniques used for NOx control, such as PCC and SCR for lean burn engines, and PSC for rich burn engines. Factors are based on large population of engines. Factors are for engines at all loads, except as indicated. SCC = Source Classification Code. TOC = Total Organic Compounds. PM-10 = Particulate Matter ≤ 10 microns (μm) aerodynamic diameter. A "<" sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

[b] Emission factors were calculated in units of (lb/MMBtu) based on procedures in EPA Method 19. To convert from (lb/MMBtu) to (lb/10^6 scf), multiply by the heat content of the fuel. If the heat content is not available, use 1020 Btu/scf. To convert from (lb/MMBtu) to (lb/hp-hr) use the following equation:

$$\text{lb/hp-hr} = (\text{lb/MMBtu})\,(\text{heat input, MMBtu/hr})\,(\text{1/operating HP, 1/hp})$$

[c] Emission tests with unreported load conditions were not included in the data set.

[d] Based on 99.5% conversion of the fuel carbon to CO_2. CO_2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/10^6 scf, and

h = heating value of natural gas (assume 1020 Btu/scf at 60°F).

[e] Based on 100% conversion of fuel sulfur to SO_2. Assumes sulfur content in natural gas of 2,000 gr/10^6scf.

[f] Emission factor for TOC is based on measured emission levels from 22 source tests.

[g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor. Measured emission factor for methane compares well with the calculated emission factor, 1.31 lb/MMBtu vs. 1.25 lb/MMBtu, respectively.

[h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds less ethane and methane.

[i] Considered ≤ 1 μm in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).

[j] PM Condensable = PM Condensable Inorganic + PM-Condensable Organic

[k] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

[l] For lean burn engines, aldehyde emissions quantification using CARB 430 may reflect interference with the sampling compounds due to the nitrogen concentration in the stack. The presented emission factor is based on FTIR measurements. Emissions data based on CARB 430 are available in the background report.

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO_x) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO_x burners	50	D	84	B
Controlled - Low NO_x burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from $lb/10^6$ scf to $kg/10^6\ m^3$, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

[b] Expressed as NO_2. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO_x emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO_x emission factor.

[c] NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_X burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. TOC = Total Organic Compounds. VOC = Volatile Organic Compounds.

[b] Based on approximately 100% conversion of fuel carbon to CO_2. $CO_2[lb/10^6$ scf] = (3.67) (CON) (C)(D), where CON = fractional conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.76), and D = density of fuel, $4.2x10^4$ $lb/10^6$ scf.

[c] All PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM_1 emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

[d] Based on 100% conversion of fuel sulfur to SO_2.
Assumes sulfur content is natural gas of 2,000 grains/10^6 scf. The SO_2 emission factor in this table can be converted to other natural gas sulfur contents by multiplying the SO_2 emission factor by the ratio of the site-specific sulfur content (grains/10^6 scf) to 2,000 grains/10^6 scf.

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
91-57-6	2-Methylnaphthalene[b, c]	2.4E-05	D
56-49-5	3-Methylchloranthrene[b, c]	<1.8E-06	E
	7,12-Dimethylbenz(a)anthracene[b,c]	<1.6E-05	E
83-32-9	Acenaphthene[b,c]	<1.8E-06	E
203-96-8	Acenaphthylene[b,c]	<1.8E-06	E
120-12-7	Anthracene[b,c]	<2.4E-06	E
56-55-3	Benz(a)anthracene[b,c]	<1.8E-06	E
71-43-2	Benzene[b]	2.1E-03	B
50-32-8	Benzo(a)pyrene[b,c]	<1.2E-06	E
205-99-2	Benzo(b)fluoranthene[b,c]	<1.8E-06	E
191-24-2	Benzo(g,h,i)perylene[b,c]	<1.2E-06	E
205-82-3	Benzo(k)fluoranthene[b,c]	<1.8E-06	E
106-97-8	Butane	2.1E+00	E
218-01-9	Chrysene[b,c]	<1.8E-06	E
53-70-3	Dibenzo(a,h)anthracene[b,c]	<1.2E-06	E
25321-22-6	Dichlorobenzene[b]	1.2E-03	E
74-84-0	Ethane	3.1E+00	E
206-44-0	Fluoranthene[b,c]	3.0E-06	E
86-73-7	Fluorene[b,c]	2.8E-06	E
50-00-0	Formaldehyde[b]	7.5E-02	B
110-54-3	Hexane[b]	1.8E+00	E
193-39-5	Indeno(1,2,3-cd)pyrene[b,c]	<1.8E-06	E
91-20-3	Naphthalene[b]	6.1E-04	E
109-66-0	Pentane	2.6E+00	E
85-01-8	Phenanathrene[b,c]	1.7E-05	D

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TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION (Continued)

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
74-98-6	Propane	1.6E+00	E
129-00-0	Pyrene[b, c]	5.0E-06	E
108-88-3	Toluene[b]	3.4E-03	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. Emission Factors preceeded with a less-than symbol are based on method detection limits.

[b] Hazardous Air Pollutant (HAP) as defined by Section 112(b) of the Clean Air Act.

[c] HAP because it is Polycyclic Organic Matter (POM). POM is a HAP as defined by Section 112(b) of the Clean Air Act.

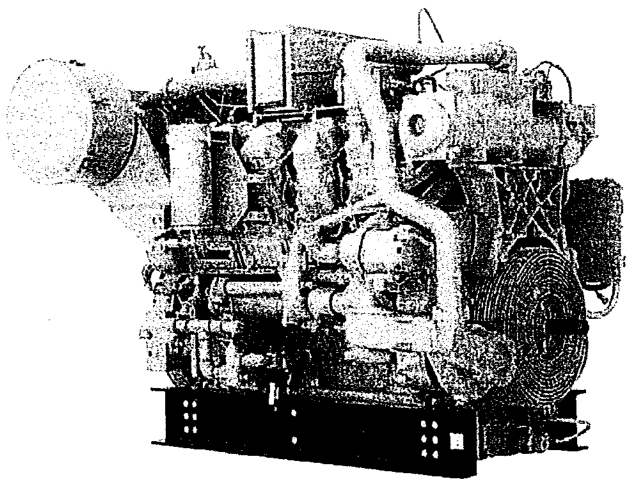
[d] The sum of individual organic compounds may exceed the VOC and TOC emission factors due to differences in test methods and the availability of test data for each pollutant.

CATERPILLAR®

G3508 LE Gas Petroleum Engine

500 bkW (670 bhp)
1400 rpm

2.0 g/bhp-hr NOx (NTE)



Shown with Optional Equipment

CAT® ENGINE SPECIFICATIONS

V-8, 4-Stroke-Cycle

Bore	170 mm (6.7 in.)
Stroke	190 mm (7.5 in.)
Displacement	34.5 L (2105 cu. in.)
Aspiration	Turbocharged-Aftercooled
Digital Engine Management	
Governor and Protection	Electronic (ADEM™ A3)
Combustion	Low Emission (Lean Burn)
Engine Weight, net dry (approx)	5420 kg (11,950 lb)
Power Density	10.9 kg/kW (17.8 lb/bhp)
Power per Displacement	19.4 bhp/L
Total Cooling System Capacity	124.9 L (33 gal)
Jacket Water	113.6 L (30 gal)
SCAC	11.4 L (3 gal)
Lube Oil System (refill)	230.9 L (61 gal)
Oil Change Interval	1000 hours
Rotation (from flywheel end)	Counterclockwise
Flywheel and Flywheel Housing	SAE No. 00
Flywheel Teeth	183

FEATURES

Engine Design
- Proven reliability and durability
- Ability to burn a wide spectrum.of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range

Emissions
Meets U.S. EPA Spark Ignited Stationary NSPS Emissions for 2007/8

Advanced Digital Engine Management
ADEM A3 control system providing integrated ignition, speed governing, protection, and controls, including detonation-sensitive variable ignition timing. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

Lean Burn Engine Technology
Lean-burn engines operate with large amounts of excess air. The excess air absorbs heat during combustion reducing the combustion temperature and pressure, greatly reducing levels of NOx. Lean-burn design also provides longer component life and excellent fuel consumption.

Ease of Operation
Side covers on block allow for inspection of internal components

Full Range of Attachments
Large variety of factory-installed engine attachments reduces packaging time

Testing
Every engine is full-load tested to ensure proper engine performance.

Gas Engine Rating Pro
GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

Product Support Offered Through Global Cat Dealer Network
More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Cat parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•S℠ program matches your oil and coolant samples against Caterpillar set standards to determine:
- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience
Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products.
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

Web Site
For all your petroleum power requirements, visit www.catoilandgas.cat.com.

STANDARD EQUIPMENT

Air Inlet System
Remote air inlet adapters

Charging System
Battery chargers

Cooling System
Jacket water thermostats and housing — full open temperature 98°C (208°F)
Jacket water pump — gear driven, centrifugal, non-self-priming
Aftercooler water pump — gear driven, centrifugal, non-self-priming
Aftercooler core for sea-air atmosphere
Aftercooler thermostats and housing — full open temperature 35°C (95°F)
Aftercooler — raw water, cleanable

Exhaust System
Exhaust manifolds — watercooled

Flywheels & Flywheel Housings
SAE No. 00 flywheel
SAE No. 00 flywheel housing
SAE standard rotation

Fuel System
Gas pressure regulator
Natural gas carburetor
Fuel gas shut-off valve (24V DC)

Instrumentation
Advisor panel
Advisor interconnect harness

Lubrication System
Crankcase breathers — top mounted
Oil cooler
Oil filter — RH
Oil pan — shallow
Oil sampling valve
Turbo oil accumulator

Mounting System
Rails, engine mounting

Power Take-Offs
Front housing — two-sided
Front lower LH accessory drive

Protection System
Electronic shutoff system
Gas shutoff valve

General
Paint — Cat yellow
Vibration damper and guard

OPTIONAL EQUIPMENT

Air Inlet System
Remote air inlet adapters

Charging System
Battery chargers

Cooling System
Aftercooler core
Thermostatic valves
Connections
Expansion and overflow tank
Water level switch gauge

European Certifications
European Union certifications

Exhaust System
Flexible fittings
Elbows
Flanges
Flange and exhaust expanders
Mufflers

Fuel System
Fuel filter

Instrumentation
Customer communication modules

Lubrication System
Oil filters — duplex
Oil pan drain
Oil level regulator
Sump pumps
Lubricating oil

Mounting System
Rails
Vibration isolators

Power Take-Offs
Auxiliary drive shaft
Auxiliary drive pulleys
Front stub shaft
Pulleys

Protection System
Gas valve
Explosion relief valves

Starting System
Air pressure regulator
Air silencer
JW heaters
Battery sets (24-volt dry)
Battery accessories

General
Flywheel guard removal
Engine barring group
Premium 8:1 pistons

TECHNICAL DATA

G3508 LE Gas Petroleum Engine — 1400 rpm

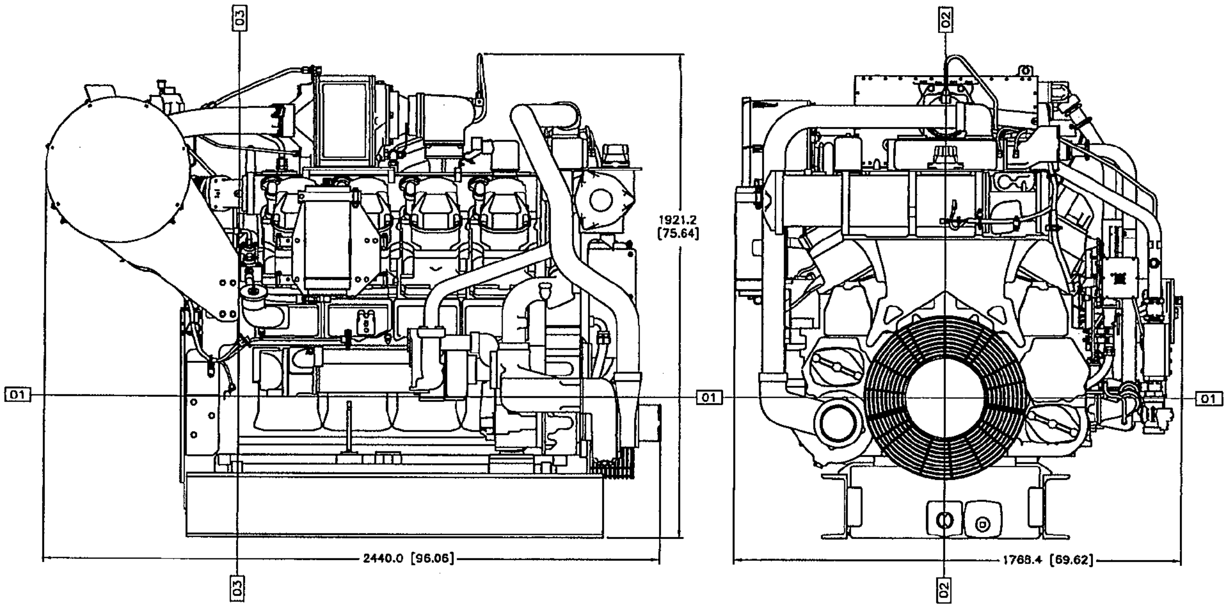
		2 g NOx NTE Rating DM8621-2
Engine Power		
@ 100% Load	bkW (bhp)	500 (670)
@ 75% Load	bkW (bhp)	375 (502)
Engine Speed	rpm	1400
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	609.6 (2000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	25
SCAC Temperature	°C (°F)	54 (130)
Emissions*		
NOx	g/bkW-hr (g/bhp-hr)	2.68 (2)
CO	g/bkW-hr (g/bhp-hr)	2.47 (1.84)
CO_2	g/bkW-hr (g/bhp-hr)	627 (468)
VOC**	g/bkW-hr (g/bhp-hr)	0.41 (0.3)
Fuel Consumption* **		
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	10.63 (7510)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	11.22 (7936)
Heat Balance		
Heat Rejection to Jacket Water		
@ 100% Load	bkW (Btu/min)	319.8 (18,204)
@ 75% Load	bkW (Btu/min)	282 (16,013)
Heat Rejection to Aftercooler		
@ 100% Load	bkW (Btu/min)	80 (4555)
@ 75% Load	bkW (Btu/min)	56.1 (3191)
Heat Rejection to Exhaust		
@ 100% Load (LHV to 77° F / 25° C)	bkW (Btu/mn)	481.9 (27,406)
@ 75% Load (LHV to 77°) (LHV to 77° F / 25° C)	bkW (Btu/mn)	372.8 (21,203)
Exhaust System		
Exhaust Gas Flow Rate (@ stack temp.,14.5 psig)		
@ 100% Load	m³/min (cfm)	115.7 (4086)
@ 75% Load	m³/min (cfm)	89.57 (3163)
Exhaust Stack Temperature		
@ 100% Load	°C (°F)	529 (985)
@ 75% Load	°C (°F)	525 (977)
Intake System		
Air Inlet Flow Rate		
@ 100% Load	m³/min (scfm)	39.53 (1396)
@ 75% Load	m³/min (scfm)	30.72 (1085)
Gas Pressure	kPag (psig)	242-276 (35-40)

*at 100% load and speed, all values are listed as not to exceed
**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJJ
***ISO 3046/1

CATERPILLAR® **G3508 LE** **GAS PETROLEUM ENGINE**

500 bkW (670 bhp)

GAS PETROLEUM ENGINE



DIMENSIONS		
Length	mm (in)	2440.0 (96.06)
Width	mm (in)	1768.4 (69.62)
Height	mm (in)	1921.2 (75.64)
Shipping Weight	kg (lb)	5420 (11,950)

Note: General configuration not to be used for installation. See general dimension drawings for detail (drawing #315-3136).

Dimensions are in mm (inches).

RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/ generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

Conditions: Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in. Hg) and 15° C (59° F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in. Hg) and 15.6° C (60.1° F). Air flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and 25° C (77° F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and stack temperature.

G3508 LE

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1400	FUEL SYSTEM:	HPG IMPCO
COMPRESSION RATIO:	8:1	**SITE CONDITIONS:**	
AFTERCOOLER WATER INLET (°F):	130	FUEL:	Field Gas
JACKET WATER OUTLET (°F):	210	FUEL PRESSURE RANGE(psig):	35.0-40.0
COOLING SYSTEM:	JW+OC , AC	FUEL METHANE NUMBER:	62.2
IGNITION SYSTEM:	ADEM3	FUEL LHV (Btu/scf):	1027
EXHAUST MANIFOLD:	ASWC	ALTITUDE(ft):	500
COMBUSTION:	Low Emission	MAXIMUM INLET AIR TEMPERATURE(°F):	100
NOx EMISSION LEVEL (g/bhp-hr NOx):	2.0	NAMEPLATE RATING:	630 bhp@1400rpm
SET POINT TIMING:	25.4		

			MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING	NOTES	LOAD	100%	100%	75%	50%
ENGINE POWER	(1)	bhp	630	627	471	315
INLET AIR TEMPERATURE		°F	98	100	100	100
ENGINE DATA						
FUEL CONSUMPTION (LHV)	(2)	Btu/bhp-hr	7820	7828	8156	9047
FUEL CONSUMPTION (HHV)	(2)	Btu/bhp-hr	8641	8650	9012	9997
AIR FLOW	(3)	lb/hr	5817	5798	4462	3135
AIR FLOW WET (77°F, 14.7 psia)	(3)	scfm	1312	1308	1006	707
INLET MANIFOLD PRESSURE	(4)	in Hg(abs)	64.1	63.9	49.5	36.3
EXHAUST STACK TEMPERATURE	(5)	°F	856	856	851	839
EXHAUST GAS FLOW (@ stack temp, 14.5 psia)	(6)	ft3/min	3485	3473	2666	1863
EXHAUST GAS MASS FLOW	(6)	lb/hr	6054	6034	4647	3272
EMISSIONS DATA						
NOx (as NO2)	(7)	g/bhp-hr	2.00	2.00	2.51	3.04
CO	(7)	g/bhp-hr	2.04	2.04	2.17	2.18
THC (molecular wt. of 15.84)	(7)	g/bhp-hr	2.38	2.38	2.41	2.44
NMHC (molecular wt. of 15.84)	(7)	g/bhp-hr	0.62	0.62	0.62	0.63
NMNEHC (molecular wt. of 15.84)	(7)	g/bhp-hr	0.41	0.42	0.42	0.43
HCHO (Formaldehyde)	(7)	g/bhp-hr	0.28	0.28	0.28	0.31
CO2	(7)	g/bhp-hr	543	544	566	628
EXHAUST OXYGEN	(8)	% DRY	7.4	7.4	7.1	6.6
HEAT REJECTION						
HEAT REJ. TO JACKET WATER	(9)	Btu/min	22941	22915	19677	17225
HEAT REJ. TO ATMOSPHERE	(9)	Btu/min	3188	3179	2650	2126
HEAT REJ. TO LUBE OIL	(9)	Btu/min	3421	3417	2935	2569
HEAT REJ. TO AFTERCOOLER	(9)(10)	Btu/min	4684	4762	2492	766

HEAT EXCHANGER SIZING CRITERIA			
HEAT REJ. TO JACKET WATER/LUBE OIL CIRCUIT	(10)	Btu/min	29341
HEAT REJ. TO AFTERCOOLER	(10)(11)	Btu/min	5000
A cooling system safety factor of 0% has been added to the heat exchanger sizing criteria.			

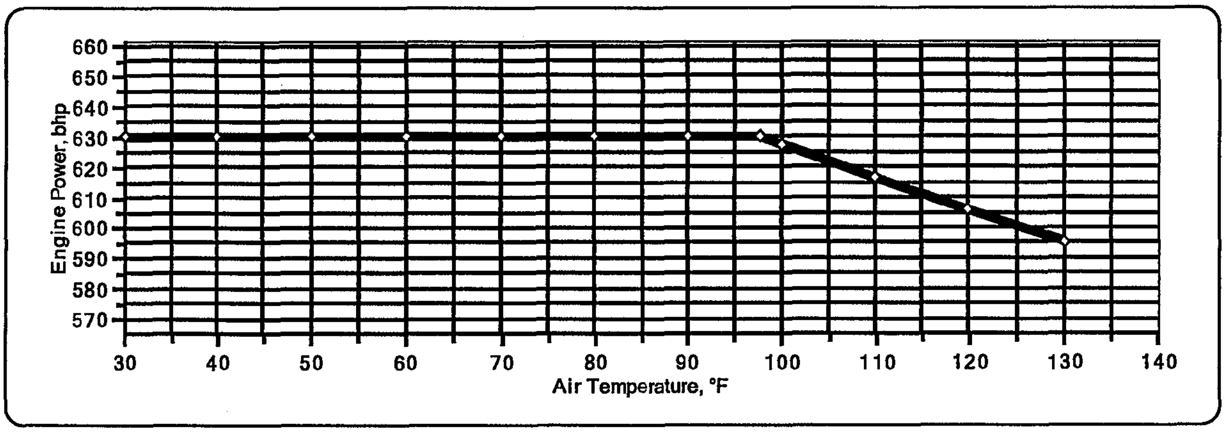
CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordence with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature.
100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature.
Max. rating is the maximum capability for the specified fuel at site altitude and reduced inlet air temperature.
Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

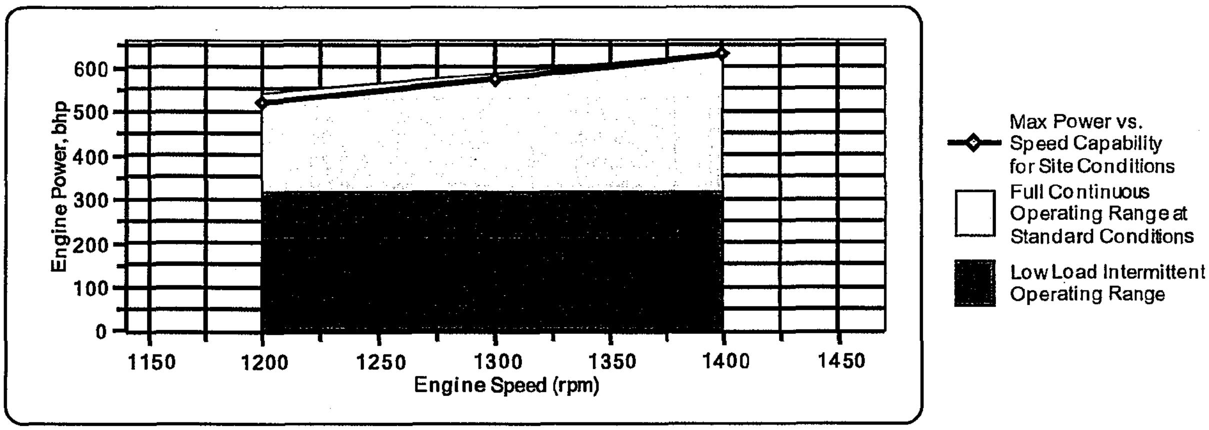
For notes information consult page three.

PREPARED BY:
Data generated by Gas Engine Rating Pro Version 3.00.00
Ref. Data Set DM8585-00-003, Printed 26Feb2008

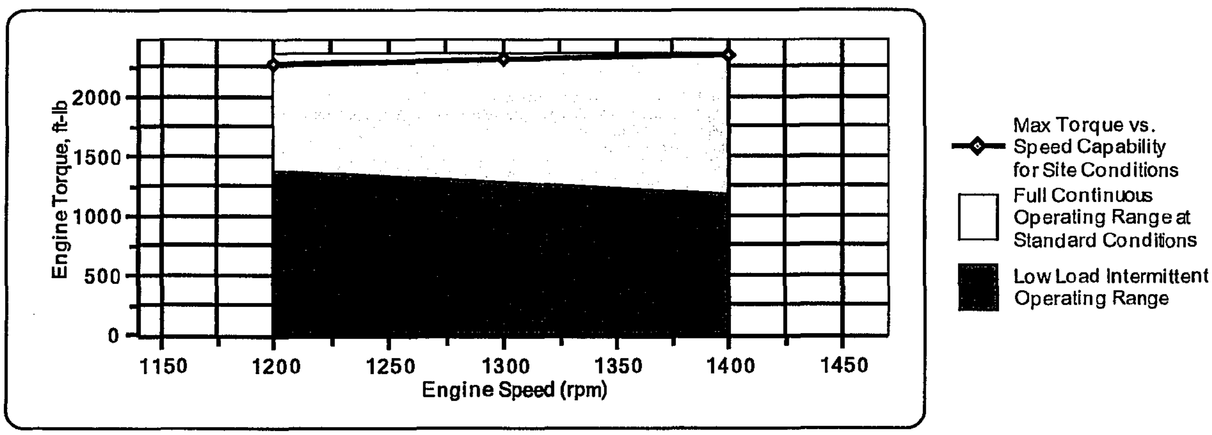
Engine Power vs. Inlet Air Temperature



Engine Power vs. Engine Speed



Engine Torque vs. Engine Speed



NOTES

1. Engine rating is with two engine driven water pumps. Tolerance is ± 3% of full load.

2. Fuel consumption tolerance is ± 3.0% of full load data.

3. Undried air. Flow is a nominal value with a tolerance of ± 5 %.

4. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

5. Exhaust stack temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

6. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

7. Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load. Fuel methane number cannot vary more than ± 3. NOx values are set points and will vary with operating conditions. All other emission values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate "not to exceed"values. Part load data may require engine adjustment.

8. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

9. Heat rejection values are nominal. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for radiation, ± 20% for lube oil circuit, and ± 5% for aftercooler circuit.

10. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.

11. Heat exchanger sizing criteria are maximum heat rejection for the site, with applied tolerances.

G3508 LE

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA

CATERPILLAR®

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	2.5211	2.5211
Methane	CH4	86.6340	86.6340
Ethane	C2H6	4.9767	4.9767
Propane	C3H8	3.5670	3.5670
Isobutane	iso-C4H1O	0.0000	0.0000
Norbutane	nor-C4H1O	1.8211	1.8211
Isopentane	iso-C5H12	0.0000	0.0000
Norpentane	nor-C5H12	0.4802	0.4802
Hexane	C6H14	0.0000	0.0000
Heptane	C7H16	0.0000	0.0000
Nitrogen	N2	0.0000	0.0000
Carbon Dioxide	CO2	0.0000	0.0000
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0000	0.0000
Nonane	C9H20	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		100.0000	100.0000

Fuel Makeup:	Field Gas
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	62.2
Lower Heating Value (Btu/scf):	1027
Higher Heating Value (Btu/scf):	1135
WOBBE Index (Btu/scf):	1274
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.997
Stoich A/F Ratio (Vol/Vol):	10.68
Stoich A/F Ratio (Mass/Mass):	16.43
Specific Gravity (Relative to Air):	0.650
Specific Heat Constant (K):	1.297

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

PREPARED BY:
Data generated by Gas Engine Rating Pro Version 3.00.00
Ref. Data Set DM8585-00-003, Printed 26Feb2008

SITE DATA

OIL & GAS STANDARD PERMIT REGISTRATION

SUGARKANE CTB - BAKER DEHY UNIT

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Representative Analyses:
Etheridge B1
and Laird B1

Stream Compositions:

	Stream 1		Stream 2		Stream 3		Stream 4	
	Inlet Gas		Flare Assist Gas		LP Condensate		Produced Water	
Component	mole %	wgt. %	mole %	wgt. %	mole %	wgt. %	mole %	wgt %
Nitrogen	0.254%	0.301%	0.164%	0.202%	0.048%	0.012%	0.000%	0.000%
Carbon Dioxide	2.372%	4.419%	2.163%	4.184%	0.125%	0.049%	0.001%	0.002%
Water	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	99.000%	94.121%
Hydrogen Sulfide	0.015%	0.022%	0.015%	0.022%	0.000%	0.000%	0.000%	0.000%
Methane	70.652%	47.978%	75.685%	53.363%	2.101%	0.302%	0.021%	0.018%
Ethane	14.029%	17.856%	11.765%	15.548%	2.081%	0.561%	0.021%	0.033%
Propane	6.979%	13.027%	4.689%	9.087%	3.619%	1.431%	0.036%	0.084%
I-Butane	1.061%	2.610%	0.899%	2.296%	1.260%	0.657%	0.013%	0.040%
N-Butane	2.235%	5.499%	1.663%	4.248%	3.992%	2.081%	0.040%	0.123%
I-Pentane	0.661%	2.019%	0.652%	2.067%	2.779%	1.798%	0.028%	0.107%
N-Pentane	0.665%	2.031%	0.623%	1.975%	3.830%	2.478%	0.038%	0.145%
Cyclopentane	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
n-Hexane	0.218%	0.795%	0.279%	1.057%	3.069%	2.372%	0.031%	0.141%
Cyclohexane	0.088%	0.321%	0.137%	0.519%	1.076%	0.831%	0.011%	0.050%
Other Hexanes	0.401%	1.463%	0.517%	1.958%	4.278%	3.306%	0.043%	0.196%
Heptanes	0.193%	0.819%	0.347%	1.528%	7.783%	6.993%	0.078%	0.412%
Octanes	0.044%	0.213%	0.109%	0.547%	6.618%	6.779%	0.066%	0.398%
Nonanes	0.025%	0.136%	0.058%	0.327%	5.967%	6.863%	0.060%	0.406%
Decanes Plus	0.007%	0.042%	0.014%	0.088%	46.045%	58.753%	0.460%	3.454%
Benzene	0.027%	0.089%	0.034%	0.117%	0.426%	0.298%	0.004%	0.016%
Toluene	0.062%	0.242%	0.132%	0.534%	1.824%	1.507%	0.018%	0.087%
Ethylbenzene	0.004%	0.018%	0.006%	0.028%	0.443%	0.422%	0.004%	0.022%
Xylene	0.023%	0.103%	0.065%	0.303%	2.634%	2.508%	0.026%	0.146%
Totals	100.02%	100.00%	100.02%	100.00%	99.998%	100.00%	99.999%	100.00%
Totals (C3+)		29.43%		26.68%		99.08%		5.83%
VOC max (%)		30.00%		30.00%		100.00%		10.00%
Benzene Max (%)		0.13%		0.18%		0.45%		0.02%
Higher Heating Value (Btu/scf)	1358		1315					
Lower Heating Value (Btu/scf)	1335		1292					
Specific Gravity	0.8185				0.7873			

NOTE: the Gas Analyses used for the Site as a representative analysis was chosen because of its proximity, shale location, and production characteristics. Due to these similiarities it is anticipated the samples will be representative to the Site. Because these sites are still being constructed and wells have yet to be drilled, Burlington Resources is using the best available representative data in that area at this time. Burlington is pro-actively sampling sites in that area and each application reflects the most representative sample available. Additionally, H2S representations are also from nearby representative data, as shown in Figure 6-1. Please note that this is in an effort to comply with the TCEQ guidance on representative samples in the most conservative manner possible. This approach has been discussed and previously approved with multiple TCEQ reviewers.

SGS LABORATORY REFERENCE NUMBER : **6889-250891**

Conoco Phillips

ID:	**Etheridge B1**	LINE PRESSURE:	**81 PSI**
AREA:	**Eagleford**	LINE TEMPERATURE:	**84 F**
METER:	**Low Pressure Separator**	CYLINDER NUMBER:	**0036**
LEASE:		EFFECTIVE DATE:	
OPERATOR:		SAMPLED BY:	**Robert Hester**
STATION:		ANALYZED BY:	**Kerry Quave**
SAMPLE DATE:	**12/20/2011**	ANALYZED DATE:	**12/24/2011**
SAMPLE OF:	**Gas**	SAMPLE TYPE:	**Spot**

Physical Properties per GPA 2145-09 — Calculations per GPA 2286-03

Note: Zero = Less than detection limit

	MOL%	WEIGHT%	GPM @ 14.696
NITROGEN	0.254	0.301	
CARBON DIOXIDE	2.372	4.421	
METHANE	70.652	47.999	
ETHANE	14.029	17.864	3.759
PROPANE	6.979	13.033	1.926
ISOBUTANE	1.061	2.612	0.348
N-BUTANE	2.235	5.501	0.706
ISOPENTANE	0.661	2.020	0.242
N-PENTANE	0.665	2.032	0.241
HEXANES	0.566	2.065	0.234
HEPTANES PLUS	0.526	2.152	0.213
	100.000	100.000	7.669

BTU	**Vol. IDEAL Gas Fuel**	**Vol. Real Gas Fuel**
BTU @ 14.696 PSIA (DRY)	1351.7	1357.6
BTU @ 14.696 PSIA (SAT.)	1328.1	1334.5
Specific Gravity	0.8153	0.8185
Compressibility (Z)	0.9957	

Gasoline Content (Gallons Per Thousand - GPM)

Ethane & Heavier	7.456
Propane & Heavier	3.697
Butane & Heavier	1.771
Pentane & Heavier	0.717
Total 26 psi Reid V.P. Gasoline GPM	1.391

Secondary BTU Psia Base	**Vol. IDEAL Gas Fuel**	**Vol. Real Gas Fuel**
BTU @ 15.025 PSIA (DRY)	1381.9	1388.1
BTU @ 15.025 PSIA (SAT.)	1357.8	1364.5

Compressibility (Z) at 15.025 = 0.9956

Remarks:
Remarks:

Precision parameters apply in the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

SGS LABORATORY REFERENCE NUMBER : **6889-250891**

COMPANY: Conoco Phillips **SAMPLE DATE: ########**
AREA / FIELD: Eagleford
LEASE:

	MOL%	WEIGHT%	GPM @ 14.696
NITROGEN	0.254	0.301	0.028
CARBON DIOXIDE	2.372	4.421	0.406
METHANE	70.652	47.999	11.999
ETHANE	14.029	17.864	3.759
PROPANE	6.979	13.033	1.926
ISOBUTANE	1.061	2.612	0.348
N-BUTANE	2.235	5.501	0.706
ISOPENTANE	0.661	2.020	0.242
N-PENTANE	0.665	2.032	0.241
2,2-Dimethylbutane	0.013	0.047	0.005
2,3-Dimethylbutane & Cyclopentane	0.000	0.000	0.000
2-Methylpentane	0.206	0.752	0.086
3-Methylpentane	0.129	0.470	0.053
n-Hexane	0.218	0.796	0.090
2,2-Dimethylpentane	0.004	0.017	0.002
Methylcyclopentane	0.053	0.189	0.019
2,4-Dimethylpentane	0.000	0.000	0.000
2,2,3- Trimethylbutane	0.000	0.000	0.000
Benzene	0.027	0.089	0.008
3,3-Dimethylpentane	0.000	0.000	0.000
Cyclohexane	0.088	0.314	0.030
2-Methylhexane	0.008	0.034	0.004
2,3-Dimethylpentane	0.039	0.166	0.018
1,1-Dimethylcyclopentane	0.000	0.000	0.000
3-Methylhexane	0.007	0.030	0.003
l,t-3-Dimethylcyclopentane	0.004	0.017	0.002
1,c-3-Dimethylcyclopentane & 3-Ethylpentane	0.006	0.025	0.002
l,t-2-Dimethylcyclopentane & 2,2,4- Trimethylpentane	0.000	0.000	0.000
n-Heptane	0.073	0.310	0.034
Methylcyclohexane	0.051	0.212	0.021
1,1,3- Trimethylcyclopentane & 2,2-Dimethylhexane	0.001	0.005	0.000
2,5-Dimethylhexane & 2,4-Dimethylhexane	0.002	0.010	0.001
Ethylcyclopentane	0.001	0.004	0.000
2,2,3- Trimethylpentane & 1,t-2,c-4- Trimethylcyclopentane	0.000	0.000	0.000
3,3-Dimethylhexane & 1,t-2,c-3- Trimethylcyclopentane	0.000	0.000	0.000
2,3,4- Trimethylpentane & 2,3.Dimethylhexane	0.000	0.000	0.000
Toluene	0.062	0.242	0.021
1,1,2- Trimethylcyclopentane	0.000	0.000	0.000
3,4-Dimethylhexane	0.000	0.000	0.000
2-Methylheptane	0.012	0.058	0.006
4-Methylheptane	0.000	0.000	0.000
1,c-2,t-4- Trimethylcyclopentane	0.000	0.000	0.000
3-Methylheptane & 3,4-Dimethylhexane	0.001	0.005	0.001

Precision parameters apply in the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

SGS LABORATORY REFERENCE NUMBER : **6889-250891**

COMPANY: Conoco Phillips **SAMPLE DATE: ########**
AREA / FIELD: Eagleford
LEASE:

	MOL%	WEIGHT%	GPM @ 14.696
1,c-3-Dimethylcyclohexane & 3-Ethylhexane	0.000	0.000	0.000
l,t-4-Dimethylcyclohexane & 1,c2,t3- Trimethylcyclopentane	0.000	0.000	0.000
2,2,5-Trimethylhexane & 1,1-Dimethylcyclohexane	0.000	0.000	0.000
Methyl-Ethylcyclopentane's & 2,2,4- Trimethylhexane	0.008	0.038	0.004
n-Octane	0.024	0.116	0.012
1,t2 Dimethylcyclohexane & 2,2,4,4- Tetramethylpentane	0.000	0.000	0.000
1,t-3-Dimethylcyclohexane & 1,c-4-Dimethylcyclohexane	0.002	0.010	0.001
Dimethylheptanes & 1 ,c-2,c-3- Trimethylcyclopentane	0.001	0.005	0.000
Isopropylcyclopentane	0.001	0.005	0.000
Dimethylheptanes & Trimethylhexanes	0.003	0.016	0.002
1,c-2-Dimethylcyclohexane	0.000	0.000	0.000
Dimethylheptanes	0.002	0.011	0.001
Ethylcyclohexane	0.000	0.000	0.000
n-Propylcyclopentane	0.000	0.000	0.000
Trimethylcyclohexanes	0.000	0.000	0.000
Ethylbenzene	0.004	0.018	0.002
Dimethylheptanes & Trimethylhexanes	0.002	0.011	0.001
m-Xylene & p-Xylene	0.007	0.031	0.003
2 & 4 Methyloctane & 3,4-Dimethylheptane	0.000	0.000	0.000
Trimethylcyclohexanes	0.000	0.000	0.000
3-Methyloctane	0.001	0.005	0.001
Trimethylcyclohexanes	0.000	0.000	0.000
o-Xylene	0.016	0.072	0.006
Trimethylcyclohexanes & Isobutylcyclopentane	0.000	0.000	0.000
n-Nonane	0.007	0.038	0.004
C9 Naphthenes & C10 Paraffins & Trimethylcyclohexanes	0.001	0.006	0.001
Isopropylbenzene & Trimethylcyclohexanes	0.001	0.005	0.000
C9 Naphthenes & C10 Paraffins	0.000	0.000	0.000
Isopropylcyclohexane	0.001	0.005	0.000
C9 Naphthenes & C10 Paraffins & Cyclooctane	0.001	0.005	0.000
N-Propylcyclohexane	0.001	0.005	0.001
C9 Naphthenes & C10 Paraffins & n-Butylcyclopentane	0.001	0.006	0.001
n-Propylbenzene	0.001	0.005	0.000
C9 Naphthenes & C10 Paraffins & EthylBenzenes	0.000	0.000	0.000
m-Ethyltoluene	0.000	0.000	0.000
p-Ethyltoluene	0.000	0.000	0.000
1,3,5- Trimethylbenzene & 4 & 5 Methylnonane	0.000	0.000	0.000
2-Methylnonane & 3-Ethyloctane	0.000	0.000	0.000
C9 Naphthenes & C10 Paraffins	0.000	0.000	0.000
O-Ethyltoluene & 3-Methylnonane	0.000	0.000	0.000
C9 Naphthenes & C10 Paraffins	0.000	0.000	0.000
tert-Butylbenzene	0.000	0.000	0.000
1,2,4 Trimethylbenzene & Methylcyclooctane	0.000	0.000	0.000
Isobutylcyclohexane & tert- Butylcyclohexane	0.000	0.000	0.000
n-Decane Plus	0.002	0.012	0.001
	100.000	100.000	20.102

Precision parameters apply in the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

SGS LABORATORY REFERENCE NUMBER : **6889-250891**

COMPANY: **Conoco Phillips** **SAMPLE DATE:** **########**
AREA / FIELD: **Eagleford**
LEASE:

Calculated Value	**Total Sample**	**Heptanes Plus**
Molecular Weight	23.613	96.508
Relative Density	0.3730	0.7611
Liquid Density (lbs/gal Absolute Density)	3.110	6.345
Liquid Density (lbs/gal Weight in Air)	3.107	6.339
Cu.Ft./Vapor / Gal. @ 14.696	49.981	24.949
Vapor Pressure @ 100° F	3660.220	0.980
API Gravity at 60° F	247.9	54.4
BTU / LB	21723	10231
BTU / GAL.	67539	60392
BTU / Cu. FT. (Vol. IDEAL Gas Fuel @ 14.696)	1351.7	5098.4
Specific Gravity as a Vapor @ 14.696	0.8153	1.6056

Heavy End Grouping Breakdown

HEXANES	C6	0.566
HEPTANES	C7	0.309
OCTANES	C8	0.162
NONANES	C9	0.046
DECANES+	C10	0.009
	Total	1.092 **Mol%**

BTEX BREAKDOWN

	Mol%	**WT.%**
BENZENE	0.027	0.089
TOLUENE	0.062	0.242
ETHYLBENZENE	0.004	0.018
XYLENES	0.023	0.103
Total BTEX	**0.116**	**0.452**

Precision parameters apply in the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

SGS LABORATORY REFERENCE NUMBER : **6889-250891**

Conoco Phillips

ID:	**Etheridge B1**	LINE PRESSURE:	**81 PSI**
AREA:	**Eagleford**	LINE TEMPERATURE:	**84 F**
METER:	**Low Pressure Separator**	CYLINDER NUMBER:	**0036**
LEASE:		EFFECTIVE DATE:	
OPERATOR:		SAMPLED BY:	**Robert Hester**
STATION:		ANALYZED BY:	**Kerry Quave**
SAMPLE DATE:	**12/20/2011**	ANALYZED DATE:	**12/24/2011**
SAMPLE OF:	**Gas**	SAMPLE TYPE:	**Spot**

Physical Properties per GPA 2145-09 | Calculations per GPA 2286-03

Note: Zero = Less than detection limit

	MOL%	WEIGHT%	GPM @ 14.696
NITROGEN	0.254	0.301	
CARBON DIOXIDE	2.372	4.421	
METHANE	70.652	47.999	
ETHANE	14.029	17.864	3.759
PROPANE	6.979	13.033	1.926
ISOBUTANE	1.061	2.612	0.348
N-BUTANE	2.235	5.501	0.706
ISOPENTANE	0.661	2.020	0.242
N-PENTANE	0.665	2.032	0.241
HEXANE	0.566	2.065	0.234
HEPTANE	0.309	1.191	0.122
OCTANE	0.162	0.690	0.066
NONANE	0.046	0.222	0.021
DECANE+	0.009	0.049	0.004
	100.000	100.000	7.669

BTU	**Vol. IDEAL Gas Fuel**	**Vol. Real Gas Fuel**
BTU @ 14.696 PSIA (DRY)	1351.7	1357.6
BTU @ 14.696 PSIA (SAT.)	1328.1	1334.5
Specific Gravity	0.8153	0.8185
Compressibility (Z)	0.9957	

Gasoline Content (Gallons Per Thousand - GPM)

Ethane & Heavier	7.456
Propane & Heavier	3.697
Butane & Heavier	1.771
Pentane & Heavier	0.717
Total 26 psi Reid V.P. Gasoline GPM	1.391

Secondary BTU Psia Base	**Vol. IDEAL Gas Fuel**	**Vol. Real Gas Fuel**
BTU @ 15.025 PSIA (DRY)	1381.9	1388.1
BTU @ 15.025 PSIA (SAT.)	1357.8	1364.5

Compressibility (Z) at 15.025 = 0.9956

Remarks:

Precision parameters apply to the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

Remarks:

SGS LABORATORY

COMPANY: Conoco Phillips
AREA / FIELD: Eaglefors

Sample Container	Sample Description	Sample Point	Sample Time	Sample Matrix	RVP by D5191	Sample Pressue, psi	Sample Temp, F
Cylinder Type/Na.or Bottle	Field/Locations.Well		Date, hours				
Station 74139 (10)	Etheridge B1	LP Separator before Dump Valve	12-20-2011 @ 11:00 AM	Condensate	9.85 psi	84	85

Chromatographic Extended Analysis - Summation Report

Component	Mol%	Liq Vol%	Wt%
Nitrogen	0.048	0.008	0.008
Carbon Dioxide	0.125	0.032	0.033
Methane	2.101	0.536	0.204
Ethane	2.081	0.838	0.379
Propane	3.619	1.501	0.967
Isobutane	1.260	0.621	0.444
N-Butane	3.992	1.895	1.406
2,2 Dimethylpropane	0.021	0.012	0.009
IsoPentane	2.779	1.530	1.215
n-Pentane	3.809	2.079	1.666
2,2 Dimethylbutane	0.069	0.043	0.036
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.293	0.181	0.153
2 Methylpentane	1.842	1.151	0.962
3 Methylpentane	1.088	0.669	0.568
n-Hexane	3.069	1.900	1.603
Heptanes Plus	73.804	87.004	90.346
Total	100.000	100.000	100.000

Characteristics of Heptanes Plus

Specific Gravity	0.8175	(Water = 1)
API Gravity	41.59	@60 F
Molecular Weight	202.0	
Vapor Volume	12.85	CF/Gal
Weight	6.81	Lbs/Gal

Characteristics of Total Sample

Specific Gravity	0.7873	(Water = 1)
API Gravity	48.24	@60 F
Molecular Weight	185.0	
Vapor Volume	15.14	CF/Gal
Weight	6.56	Lbs/Gal

Total Extended Report

Component	Mol%	Liq Vol%	Wt%
Nitrogen	0.048	0.008	0.008
Carbon Dioxide	0.125	0.032	0.033
Methane	2.101	0.536	0.204
Ethane	2.081	0.838	0.379
Propane	3.619	1.501	0.967
Isobutane	1.260	0.621	0.444
N-Butane	3.992	1.895	1.406
2,2 Dimethylpropane	0.021	0.012	0.009
IsoPentane	2.779	1.530	1.215
n-Pentane	3.809	2.079	1.666
2,2 Dimethylbutane	0.069	0.043	0.036
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.293	0.181	0.153
2 Methylpentane	1.842	1.151	0.962
3 Methylpentane	1.088	0.669	0.568
n-Hexane	3.069	1.900	1.603
Methylcyclopentane	0.986	0.526	0.503
Benzene	0.426	0.180	0.202
Cyclohexame	1.076	0.551	0.549
2-Methylhexane	1.284	0.899	0.780
3-Methylhexane	1.053	0.728	0.640
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	0.801	0.541	0.482
n-Heptane	2.776	1.928	1.686
Methylcyclohexane	1.869	1.131	1.112
Toluene	1.824	0.920	1.018
Other C-8's	4.248	3.088	2.837
n-Octane	2.370	1.828	1.641
E-Benzene	0.443	0.258	0.285
M & P Xylenes	1.938	1.132	1.247
O-Xylene	0.696	0.398	0.448
Other C-9's	3.963	3.218	3.032
n-Nonane	2.004	1.698	1.557
Other C-10's	5.024	4.483	4.301
n-Decane	1.515	1.400	1.306
Undecanes (11)	5.324	4.874	4.743
Dodecanes (12)	4.010	3.965	3.912
Tridecanes (13)	3.769	3.996	3.997
Tetradecanes (14)	3.226	3.663	3.714
Pentadecanes (15)	2.694	3.276	3.363
Hexadecanes (16)	2.180	2.835	2.934
Heptadecanes (17)	1.927	2.649	2.767
Octadecanes (18)	1.724	2.495	2.622
Nonadecanes (19)	1.600	2.413	2.551
Eicosanes (20)	1.271	1.992	2.118
Heneicosanes (21)	1.058	1.745	1.866
Docosanes (22)	0.967	1.662	1.788
Tricosanes (23)	0.757	1.349	1.459
Tetracosanes (24)	0.692	1.278	1.389
Pentacosanes (25)	0.617	1.182	1.290
Hexacosanes (26)	0.452	0.898	0.984
Heptacosanes (27)	0.493	1.015	1.118
Octacosanes (28)	0.424	0.903	0.998
Nonacosanes (29)	0.360	0.791	0.877
Triacontanes (30)	0.274	0.622	0.692
Hentriacontanes Plus (31+)	5.687	18.494	21.541
Total	100.000	100.000	100.000

SGS LABORATORY REFERENCE NUMBER : **6894-250891**

Conoco Phillips

ID:	**Laird B1**	LINE PRESSURE:	**1060 PSI**
AREA:	**Eagleford**	LINE TEMPERATURE:	**112 F**
METER:	**High Pressure Separator**	CYLINDER NUMBER:	**0110**
LEASE:		EFFECTIVE DATE:	
OPERATOR:		SAMPLED BY:	**Robert Hester**
STATION:		ANALYZED BY:	**Kerry Quave**
SAMPLE DATE:	**12/20/2011**	ANALYZED DATE:	**12/24/2011**
SAMPLE OF:	**Gas**	SAMPLE TYPE:	**Spot**

Physical Properties per GPA 2145-09 Calculations per GPA 2286-03

Note: Zero = Less than detection limit

	MOL%	WEIGHT%	GPM @ 14.696
NITROGEN	0.164	0.202	
CARBON DIOXIDE	2.163	4.187	
METHANE	75.685	53.403	
ETHANE	11.765	15.559	3.151
PROPANE	4.689	9.094	1.294
ISOBUTANE	0.899	2.298	0.295
N-BUTANE	1.663	4.251	0.525
ISOPENTANE	0.652	2.069	0.239
N-PENTANE	0.623	1.977	0.226
HEXANES	0.733	2.778	0.302
HEPTANES PLUS	0.964	4.182	0.396
	100.000	100.000	6.428

BTU	**Vol. IDEAL Gas Fuel**	**Vol. Real Gas Fuel**
BTU @ 14.696 PSIA (DRY)	1310.2	1315.3
BTU @ 14.696 PSIA (SAT.)	1287.3	1292.9
Specific Gravity	0.7850	0.7878
Compressibility (Z)	0.9961	

Gasoline Content (Gallons Per Thousand - GPM)

Ethane & Heavier	6.032
Propane & Heavier	2.881
Butane & Heavier	1.587
Pentane & Heavier	0.767
Total 26 psi Reid V.P. Gasoline GPM	1.791

Secondary BTU Psia Base	**Vol. IDEAL Gas Fuel**	**Vol. Real Gas Fuel**
BTU @ 15.025 PSIA (DRY)	1339.5	1344.8
BTU @ 15.025 PSIA (SAT.)	1316.1	1321.9

Compressibility (Z) at 15.025 = 0.9960

Remarks:
Remarks:

Precision parameters apply in the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

SGS LABORATORY REFERENCE NUMBER : **6894-250891**

COMPANY: Conoco Phillips **SAMPLE DATE: ########**
AREA / FIELD: Eagleford
LEASE:

	MOL%	WEIGHT%	GPM @ 14.696
NITROGEN	0.164	0.202	0.018
CARBON DIOXIDE	2.163	4.187	0.370
METHANE	75.685	53.403	12.848
ETHANE	11.765	15.559	3.151
PROPANE	4.689	9.094	1.294
ISOBUTANE	0.899	2.298	0.295
N-BUTANE	1.663	4.251	0.525
ISOPENTANE	0.652	2.069	0.239
N-PENTANE	0.623	1.977	0.226
2,2-Dimethylbutane	0.025	0.093	0.010
2,3-Dimethylbutane & Cyclopentane	0.000	0.000	0.000
2-Methylpentane	0.248	0.940	0.103
3-Methylpentane	0.182	0.688	0.074
n-Hexane	0.279	1.057	0.115
2,2-Dimethylpentane	0.009	0.040	0.004
Methylcyclopentane	0.062	0.229	0.022
2,4-Dimethylpentane	0.001	0.004	0.000
2,2,3- Trimethylbutane	0.000	0.000	0.000
Benzene	0.034	0.117	0.010
3,3-Dimethylpentane	0.000	0.000	0.000
Cyclohexane	0.137	0.507	0.047
2-Methylhexane	0.012	0.053	0.006
2,3-Dimethylpentane	0.071	0.313	0.032
1,1-Dimethylcyclopentane	0.000	0.000	0.000
3-Methylhexane	0.010	0.044	0.005
l,t-3-Dimethylcyclopentane	0.006	0.026	0.002
1,c-3-Dimethylcyclopentane & 3-Ethylpentane	0.009	0.039	0.004
l,t-2-Dimethylcyclopentane & 2,2,4- Trimethylpentane	0.000	0.000	0.000
n-Heptane	0.135	0.595	0.062
Methylcyclohexane	0.092	0.397	0.037
1,1,3- Trimethylcyclopentane & 2,2-Dimethylhexane	0.003	0.015	0.001
2,5-Dimethylhexane & 2,4-Dimethylhexane	0.005	0.025	0.003
Ethylcyclopentane	0.002	0.009	0.001
2,2,3- Trimethylpentane & 1,t-2,c-4- Trimethylcyclopentane	0.000	0.000	0.000
3,3-Dimethylhexane & 1,t-2,c-3- Trimethylcyclopentane	0.000	0.000	0.000
2,3,4- Trimethylpentane & 2,3.Dimethylhexane	0.000	0.000	0.000
Toluene	0.132	0.535	0.044
1,1,2- Trimethylcyclopentane	0.000	0.000	0.000
3,4-Dimethylhexane	0.000	0.000	0.000
2-Methylheptane	0.033	0.166	0.017
4-Methylheptane	0.000	0.000	0.000
1,c-2,t-4- Trimethylcyclopentane	0.000	0.000	0.000
3-Methylheptane & 3,4-Dimethylhexane	0.002	0.010	0.001

Precision parameters apply in the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

SGS LABORATORY REFERENCE NUMBER : **6894-250891**

COMPANY: Conoco Phillips **SAMPLE DATE: ########**
AREA / FIELD: Eagleford
LEASE:

	MOL%	WEIGHT%	GPM @ 14.696
1,c-3-Dimethylcyclohexane & 3-Ethylhexane	0.000	0.000	0.000
l,t-4-Dimethylcyclohexane & 1,c2,t3- Trimethylcyclopentane	0.000	0.000	0.000
2,2,5-Trimethylhexane & 1,1-Dimethylcyclohexane	0.000	0.000	0.000
Methyl-Ethylcyclopentane's & 2,2,4- Trimethylhexane	0.017	0.084	0.008
n-Octane	0.057	0.286	0.029
1,t2 Dimethylcyclohexane & 2,2,4,4- Tetramethylpentane	0.000	0.000	0.000
1,t-3-Dimethylcyclohexane & 1,c-4-Dimethylcyclohexane	0.004	0.020	0.002
Dimethylheptanes & 1 ,c-2,c-3- Trimethylcyclopentane	0.002	0.010	0.001
Isopropylcyclopentane	0.003	0.015	0.001
Dimethylheptanes & Trimethylhexanes	0.006	0.033	0.003
1,c-2-Dimethylcyclohexane	0.000	0.000	0.000
Dimethylheptanes	0.007	0.039	0.004
Ethylcyclohexane	0.000	0.000	0.000
n-Propylcyclopentane	0.000	0.000	0.000
Trimethylcyclohexanes	0.000	0.000	0.000
Ethylbenzene	0.006	0.028	0.002
Dimethylheptanes & Trimethylhexanes	0.002	0.011	0.001
m-Xylene & p-Xylene	0.019	0.089	0.007
2 & 4 Methyloctane & 3,4-Dimethylheptane	0.000	0.000	0.000
Trimethylcyclohexanes	0.000	0.000	0.000
3-Methyloctane	0.002	0.011	0.001
Trimethylcyclohexanes	0.000	0.000	0.000
o-Xylene	0.046	0.215	0.018
Trimethylcyclohexanes & Isobutylcyclopentane	0.000	0.000	0.000
n-Nonane	0.020	0.113	0.011
C9 Naphthenes & C10 Paraffins & Trimethylcyclohexanes	0.001	0.006	0.001
Isopropylbenzene & Trimethylcyclohexanes	0.001	0.005	0.000
C9 Naphthenes & C10 Paraffins	0.001	0.006	0.001
Isopropylcyclohexane	0.002	0.011	0.001
C9 Naphthenes & C10 Paraffins & Cyclooctane	0.002	0.010	0.001
N-Propylcyclohexane	0.001	0.006	0.001
C9 Naphthenes & C10 Paraffins & n-Butylcyclopentane	0.003	0.019	0.002
n-Propylbenzene	0.003	0.016	0.001
C9 Naphthenes & C10 Paraffins & EthylBenzenes	0.000	0.000	0.000
m-Ethyltoluene	0.000	0.000	0.000
p-Ethyltoluene	0.000	0.000	0.000
1,3,5- Trimethylbenzene & 4 & 5 Methylnonane	0.000	0.000	0.000
2-Methylnonane & 3-Ethyloctane	0.000	0.000	0.000
C9 Naphthenes & C10 Paraffins	0.000	0.000	0.000
O-Ethyltoluene & 3-Methylnonane	0.000	0.000	0.000
C9 Naphthenes & C10 Paraffins	0.000	0.000	0.000
tert-Butylbenzene	0.000	0.000	0.000
1,2,4 Trimethylbenzene & Methylcyclooctane	0.000	0.000	0.000
Isobutylcyclohexane & tert- Butylcyclohexane	0.000	0.000	0.000
n-Decane Plus	0.004	0.025	0.002
	100.000	100.000	19.664

Precision parameters apply in the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

SGS LABORATORY REFERENCE NUMBER : **6894-250891**

COMPANY: Conoco Phillips
AREA / FIELD: Eagleford
LEASE:

SAMPLE DATE: ########

Calculated Value	**Total Sample**	**Heptanes Plus**
Molecular Weight	22.736	98.624
Relative Density	0.3670	0.7618
Liquid Density (lbs/gal Absolute Density)	3.060	6.351
Liquid Density (lbs/gal Weight in Air)	3.057	6.345
Cu.Ft./Vapor / Gal. @ 14.696	51.074	24.437
Vapor Pressure @ 100° F	3889.010	1.010
API Gravity at 60° F	254.1	54.2
BTU / LB	21868	12034
BTU / GAL.	66890	72131
BTU / Cu. FT. (Vol. IDEAL Gas Fuel @ 14.696)	1310.2	5205.2
Specific Gravity as a Vapor @ 14.696	0.7850	1.9341

Heavy End Grouping Breakdown

HEXANES	C6	0.733
HEPTANES	C7	0.486
OCTANES	C8	0.343
NONANES	C9	0.117
DECANES+	C10	0.018
	Total	1.697 **Mol%**

BTEX BREAKDOWN

	Mol%	**WT.%**
BENZENE	0.034	0.117
TOLUENE	0.132	0.535
ETHYLBENZENE	0.006	0.028
XYLENES	0.065	0.304
Total BTEX	**0.237**	**0.984**

Precision parameters apply in the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

SGS LABORATORY REFERENCE NUMBER : **6894-250891**

Conoco Phillips

ID:	**Laird B1**	LINE PRESSURE:	**1060 PSI**
AREA:	**Eagleford**	LINE TEMPERATURE:	**112 F**
METER:	**High Pressure Separator**	CYLINDER NUMBER:	**0110**
LEASE:		EFFECTIVE DATE:	
OPERATOR:		SAMPLED BY:	**Robert Hester**
STATION:		ANALYZED BY:	**Kerry Quave**
SAMPLE DATE:	**12/20/2011**	ANALYZED DATE:	**12/24/2011**
SAMPLE OF:	**Gas**	SAMPLE TYPE:	**Spot**

Physical Properties per GPA 2145-09 — Calculations per GPA 2286-03

Note: Zero = Less than detection limit

	MOL%	WEIGHT%	GPM @ 14.696
NITROGEN	0.164	0.202	
CARBON DIOXIDE	2.163	4.187	
METHANE	75.685	53.403	
ETHANE	11.765	15.559	3.151
PROPANE	4.689	9.094	1.294
ISOBUTANE	0.899	2.298	0.295
N-BUTANE	1.663	4.251	0.525
ISOPENTANE	0.652	2.069	0.239
N-PENTANE	0.623	1.977	0.226
HEXANE	0.733	2.778	0.302
HEPTANE	0.486	1.967	0.194
OCTANE	0.343	1.527	0.141
NONANE	0.117	0.584	0.051
DECANE+	0.018	0.104	0.010
	100.000	100.000	6.428

BTU	**Vol. IDEAL Gas Fuel**	**Vol. Real Gas Fuel**
BTU @ 14.696 PSIA (DRY)	1310.2	1315.3
BTU @ 14.696 PSIA (SAT.)	1287.3	1292.9
Specific Gravity	0.7850	0.7878
Compressibility (Z)	0.9961	

Gasoline Content (Gallons Per Thousand - GPM)

Ethane & Heavier	6.032
Propane & Heavier	2.881
Butane & Heavier	1.587
Pentane & Heavier	0.767
Total 26 psi Reid V.P. Gasoline GPM	1.791

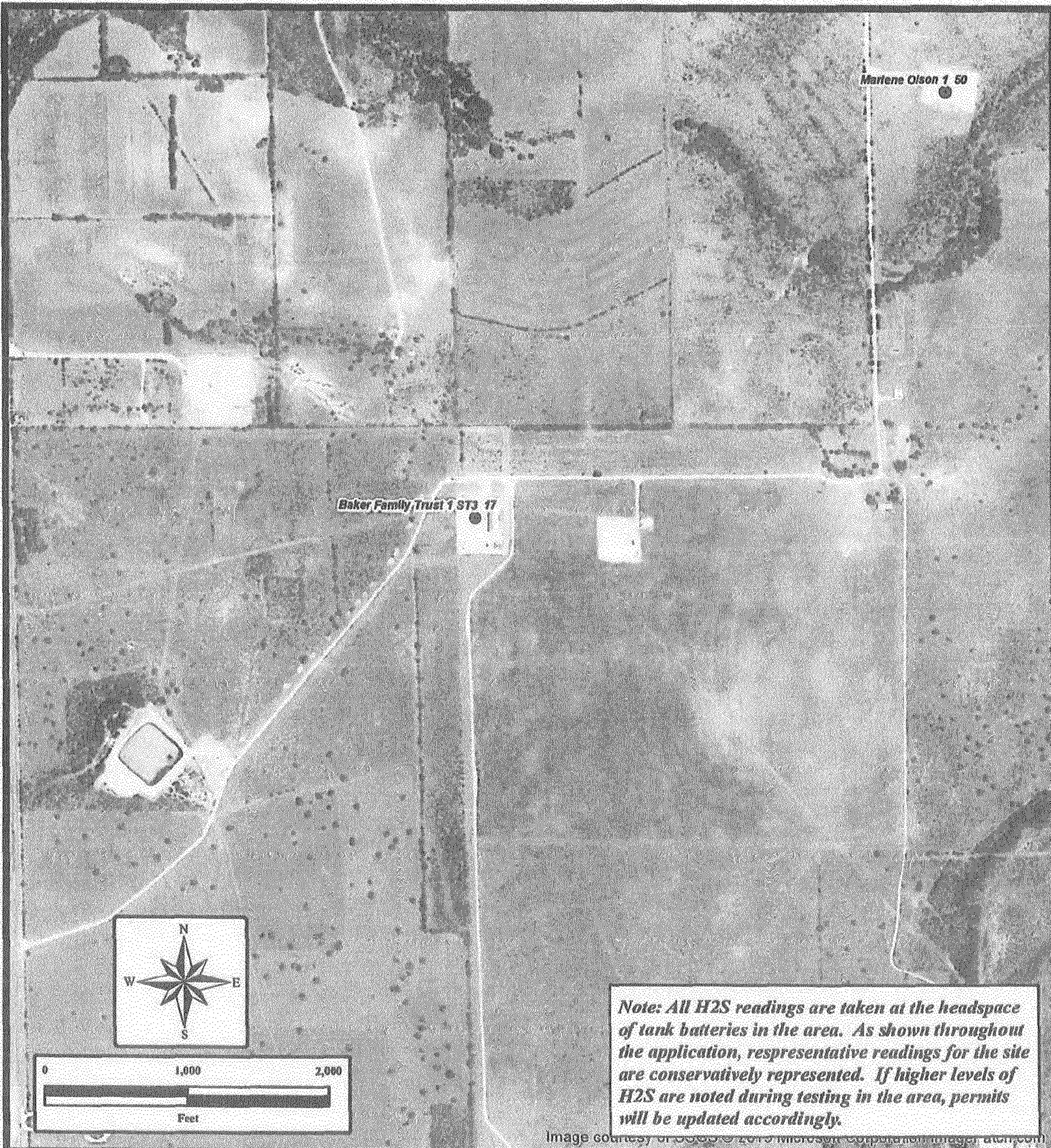
Secondary BTU Psia Base	**Vol. IDEAL Gas Fuel**	**Vol. Real Gas Fuel**
BTU @ 15.025 PSIA (DRY)	1339.5	1344.8
BTU @ 15.025 PSIA (SAT.)	1316.1	1321.9

Compressibility (Z) at 15.025 = 0.9960

Remarks:

Precision parameters apply to the determination of above test results. Also refer to ASTM D 3244-97/02, IP 367/96 and appendix E of IP standard methods for analysis and testing for utilization of test data to determine conformance with specifications.

Remarks:



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A Division of Apex Companies, LLC

FIGURE 6-1
H2S METER READING AT SITE
Burlington Resources Oil & Gas Company LP
Standard Permit Registration
Sugarkane CTB - Baker Dehy Unit
TITAN Project No. 84800507-78
February 2013
from USGS Quadrangle Pawnee, Texas
Ground Condition Depicted October 2011
Digital Data Courtesy of ESRI Online Datasets